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ABSTRACT

These modules were developed to assist teachers at the intermediate level to move away from extensive skill practice and toward more meaningful interdisciplinary learning. This packet, to be used by teachers in the summer Extended Learning Program, provides detailed thematic lesson plans matched to the Indiana Curriculum Proficiency Guide. The modules present a conceptual framework for an alternative summer program. Basic factors for success, such as active involvement, learning related to the real world, interdisciplinary instruction, teacher modeling, and cooperative learning, are covered throughout the material. The manual includes a weekly overview of lessons. It provides suggested activities, materials, direction for implementation, and reserve materials. The 41 activities are placed into one of five categories: (1) motivational day; (2) information day; (3) research day; (4) activity day; and (5) culmination day. Topics include space flight, space stations, Mars, solar system, space shuttle, food, dress, history of space exploration, and Earth's orbit. Supplementary materials include games dealing with space, readings, a diploma that can be copied, a list of NASA resources, Space Camp information, a book list, and a resource guide of tests available for assessing reasoning and higher thinking processes. (KR)

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SPACE

INTERMEDIATE LEVEL MODULES

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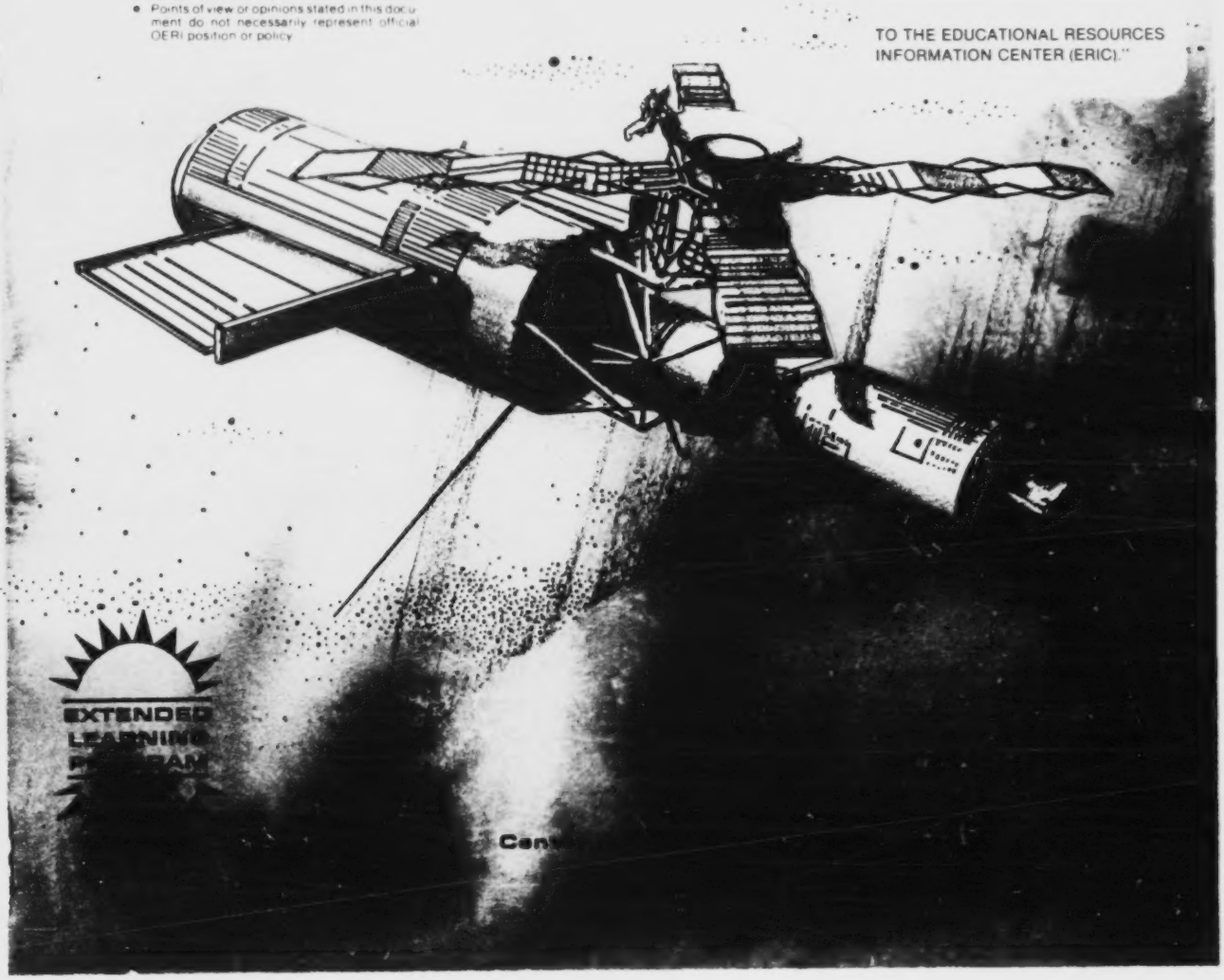

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INTRODUCTION

OVERVIEW OF MODULES

Purpose:

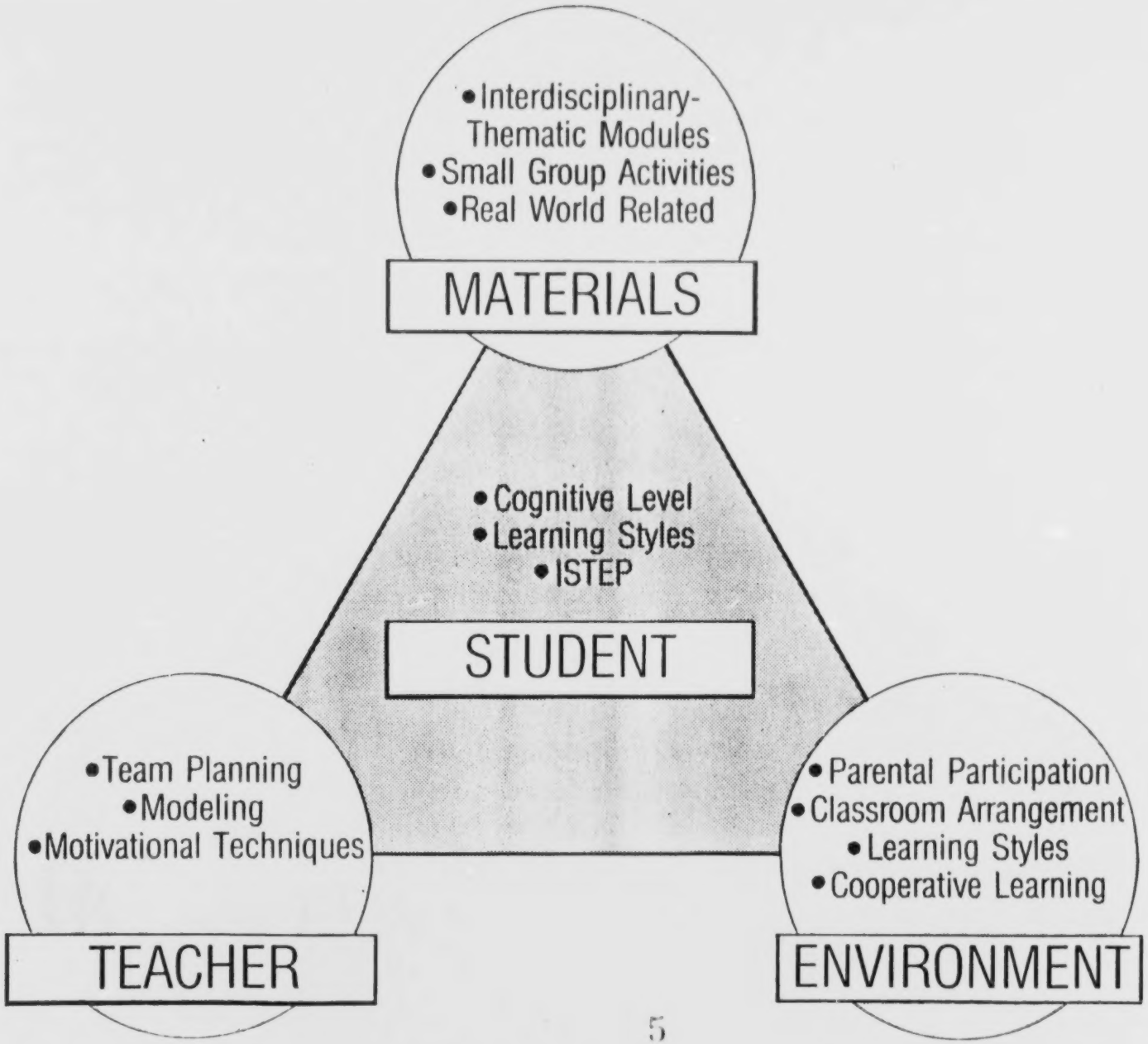
The Intermediate Level Modules packet is developed to assist teachers in the summer Extended Learning Program by providing detailed thematic lesson plans matched to the Indiana Curriculum Proficiency Guide. The modules present a conceptual framework for an alternative summer program. Basic fibers for success, such as active involvement, learning related to the real world, interdisciplinary instruction, teacher modeling, and cooperative learning, are covered throughout the material. (See curriculum guidelines.) The Manual includes a weekly overview of lessons. It provides suggested activities, materials, direction for implementation, and reserve materials. **There are more activities than might be used in a week's format.**

Planning, organizing, and collecting materials for innovative summer programming is often difficult for teachers who lack resources, time, or money.

Implementation:

These modules were developed to assist teachers at the intermediate level to move away from extensive skill practice and toward more meaningful interdisciplinary learning. It is suggested teachers select those activities of interest or of student instructional need in their specific school setting.

Teachers working as a team might **select** certain activities from the module promoting an interdisciplinary approach to the summer learning experience. These modules may act as models for teachers in developing similar thematic units.


•Interdisciplinary-
Thematic Modules
•Small Group Activities
•Real World Related
MATERIALS
•Cognitive Level
•Learning Styles
•ISTEP
STUDENT
•Team Planning
•Modeling
•Motivational Techniques
TEACHER
•Parental Participation
•Classroom Arrangement
•Learning Styles
•Cooperative Learning
ENVIRONMENT

Curriculum Guidelines
Upper Elementary and Middle Schools
Extended Learning Program

1. Active Involvement - Learning is enhanced when students participate in "hands-on" activities and experiences.

2. Relate Learning to Real World - Learning occurs naturally when students interact with their environment. Formalized learning is facilitated and reinforced when instruction is related to the real world.

3. Skill and Drill - The summer school program should deemphasize mimeographed skill and drill sheets. Activities should be utilized which actively involve the learner in the learning process.

4. Interdisciplinary Approach - A team of teachers planning instruction together maximizes the interrelatedness of learning. Themes and topics serve as a framework for attaching information.

5. Teacher MODELS - Summer school instructional strategies should emphasize teacher modeling of learning concepts with little emphasis on grades and written assignments.

6. Learning Styles - Students in need of remediation often exhibit characteristics of the tactual kinesthetic learner. Teaching strategies and materials should include instructional strands directed toward the learning styles of each student.

7. Cognitve Levels - ISTEP results do not indicate students level of formal reasoning performances. Additional testing may be used to further ascertain whether a student is functioning at the concrete, high concrete, transitional, low formal, or high formal level.

8. Cooperative Learning - Partner grouping and small groups should be encouraged as the class structural format for the summer.

9. Motivational Techniques - Teachers should utilize a variety of techniques to motivate the elementary student. Rewards, praise, personal interactions with teachers and peers, and team building are integral parts of successfull alternative programs.

10. Parental Involvement - Innovative plans should be implemented to actively involve the parents of the students involved in the Extended Learning Program. Ideas, such as a parent planning committee for decision making concerning materials and curriculum, might be implemented.

11. Computer technology - Possibilities should be emphasized in word processing, graphics, and data bases when possible.

SPACEFLIGHT
LESSON PLAN
OVERVIEW
INTERDISCIPLINARY UNIT
MIDDLE GRADES

Motivational Day

Mission Logo
Space Entry Qualifier
Reaction Time
Space Station
Pulse Rate Test
Background Information on Spaceflight
Down on Mars
Space Vocabulary Crossword Puzzle
Solar System

Information Day

Creative Letter Writing
Story Problems
Dressed for Space
Space Shuttle Menu
Astronaut Study
Problem Solving--Who Goes?
Problem Solving--What Do We Take?
Young Astronauts
Human Reaction Time
Astronomical Information

Research Day

Write letter to NASA
History of Space Exploration
Make a Spaceship
Earth's Orbit
Let's Estimate
Lost in Space

Activity Day

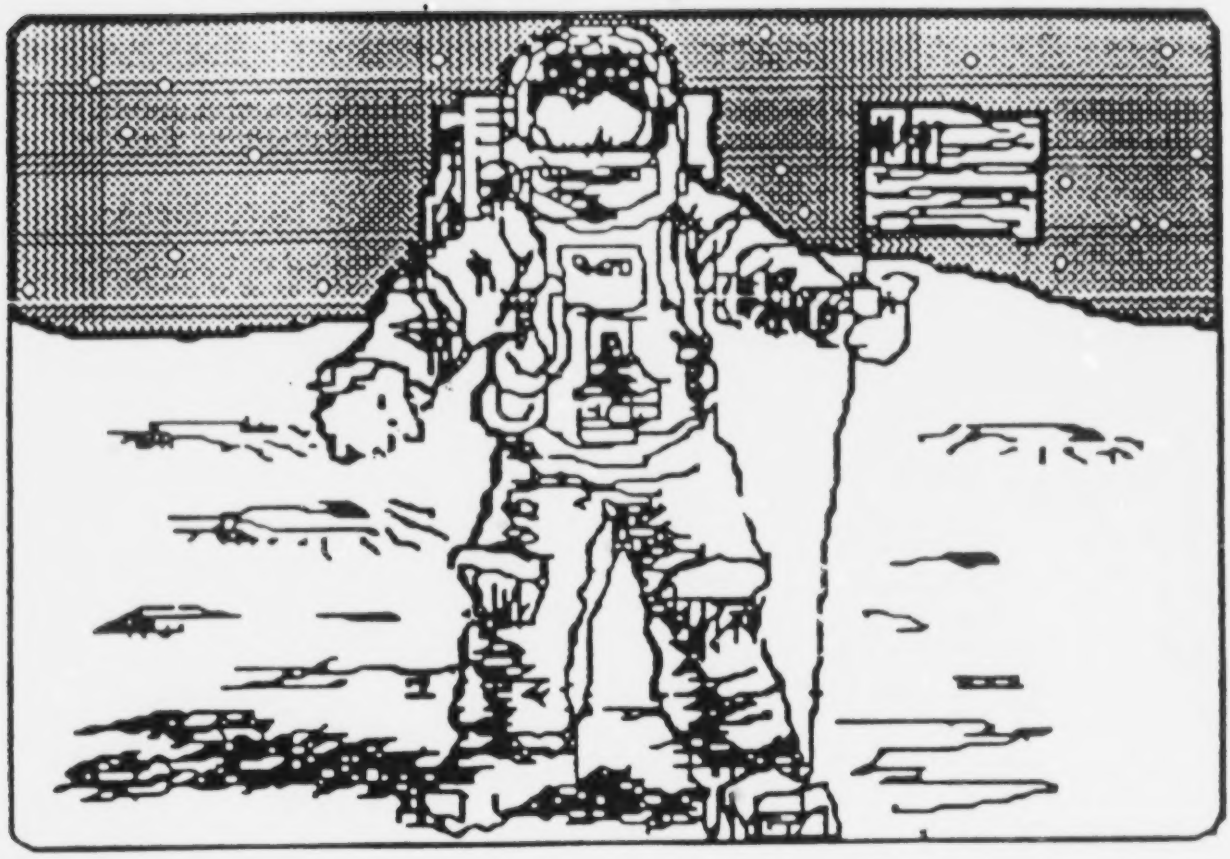
Space Application
Space Concentration Game
Shuttle Circuit Board
Assemble a Space Shuttle
Balanced Coin
Balloon-A-Tic
Creative Writing
READ
Student in Space
Subject and Predicate
Writing a Paragraph

Culmination Day

Draw an Alien
Rocket Propulsion
Paper Rockets
MIRA and the Astronauts
Watch Movie

MOTIVATIONAL

DAY



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ACTIVITY 1: MISSION LOGO

DAY: Motivational

ART PROFICIENCY/ INDICATOR: Creativity and expression.

MATERIALS: Sample NASA mission logos, computer, printer, graphics software.

For every space mission flight, a logo is developed. Incorporated into the logo design are various elements depicting the different phases of that mission. Usually the crew for that flight will design the mission logo. Shown below are logos from former space missions.

Have students design a logo for the first "Student in Space" mission.

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ACTIVITY 2: SPACE ENTRY QUALIFIER

DAY: Motivational

SCIENCE PROFICIENCY/ INDICATOR: Validating information, assessing sources of information.

MATERIALS: Space pretest and pencils

DIRECTIONS: From the list of words following this quiz, find the word that goes best with the definition. Words should be used only once.

1. A person who flies in space, whether as a crew member or a passenger.

2. The first stage of a missile or rocket.

3. A body of small mass but large volume compared to a planet, often developing a long, luminous, and partly transparent tail when close to the sun.

4. The Russian term for what in the U.S.A. is called an astronaut.

5. The hours, minutes, and finally, the seconds of time remaining before the launch of a rocket.

6. The technique of connecting two or more spacecraft in space.

7. A device which protects people or equipment from high temperatures in front of a reentry capsule as it reenters the earth's atmosphere.

8. Of, or pertaining to, the moon.

9. National Aeronautics and Space Administration.

10. An orbit which passes over the North and South Poles.

11. Engines or devices fired to reduce the speed of a spacecraft.

12. Useful cargo carried about a spaceship.

13. America's reusable spaceship.

14. The United States' first human space program.

15. The act of going outside the spacecraft.

16. Name for the United States two-man space mission.

17. To come into or go out of orbit.

18. Joint United States and U.S.S.R. space mission launched in 1975.

19. Clothing worn by an astronaut for EVA.

20. Used as a life support system for extravehicular activity.

a) backpack
b) deorbit
c) Gemini
d) cosmonaut
e) Mercury
f) payload
g) shuttle
h) lunar
i) booster
j) comet
k) polar orbit
l) countdown
m) spacesuit
n) extravehicular
o) heat shield
p) astronaut
q) docking
r) ASTP
s) retro-rockets
t) NASA

The following quiz requires only one answer per question--either **true** or **false**. The questions are designed to illustrate certain points about the space transport system known as the Shuttle.

1. **T** **F** The Shuttle will never fly to the moon.

2. **T** **F** The muffler for the launch of the Shuttle is made of water.

3. **T** **F** You can breathe one of the two components used by the three main engines of the Shuttle.

4. **T** **F** The robot arm of the Shuttle can lift up to 32 tons in space but cannot lift itself on the ground.

5. **T** **F** The Shuttle can carry up to seven people into space.

6. **T** **F** The toilet on the Shuttle uses no water.

7. **T** **F** The cargo bay of the Shuttle is long enough to park a school bus and a family car.

8. **T** **F** The payload specialists who will go into space will not be trained as astronauts.

9. **T** **F** In orbit, the Shuttle can go from one side of this country to the other in about 12 minutes.

10. **T** **F** The space Shuttle could land at any major airport.

Bonus question: **T** **F** The drinking water for the crew is made while in space.

SPACE ENTRY QUALIFIER

ANSWER SHEET

1. p
2. i
3. j
4. d
5. l
6. q
7. o
8. h
9. t
10. k
11. s
12. f
13. g
14. e
15. n
16. c
17. b
18. r
19. m
20. a

1. T
2. T
3. T
4. T
5. T
6. T
7. T
8. T
9. T
10. T

Bonus: T

ACTIVITY 3:	REACTION TIME
DAY:	Motivational
SCIENCE PROFICIENCY/ INDICATOR:	Concrete data gathering, examine interactions.
MATERIALS:	Stop watches, reaction cards (provided), pencils
DIRECTIONS:	During the space flight astronauts are required to be able to respond quickly to any given situation. Unexpected problems may arise during a spaceflight that require a rapid response to the problem. The faster the reaction time of an astronaut and the crew, the better chance they will have in dealing with a given situation.

Students can measure their reaction time by using the reaction time card (following page) in this manner:

1. Divide the class into teams of two students each. While one does the activity, the other student times his/her responses.

2. Have one student start with a finger on square one and touch each square in numerical order. The other student should record the time. Then have the same student touch the squares in reverse order. Record the time again.

3. Students should then reverse roles.

4. Allow the students to do the activity for two or three days in a row to see if their reaction time improves.

5. Compare results of boys versus girls, age groups, left-handed versus right-handed students, etc., by recording group averages on the blackboard.

6. Allow students to put their own symbols in the blank squares. They might try to devise an ordering system which is faster than numbers.

10 seconds.....slow
9 seconds.....average
7 seconds.....very good
5 seconds.....excellent

REACTION TIME CARD

TIME _____ SECONDS

8	11	5	2
1	12	9	7
6	3	10	4

TIME _____ SECONDS

TIME _____ SECONDS

4	11	7	1
6	9	10	5
2	8	12	3

TIME _____ SECONDS

Numerical

Day 1 _____ Time

Day 2 _____ Time

Day 3 _____ Time

Reverse

Day 1 _____ Time

Day 2 _____ Time

Day 3 _____ Time

Note: Try with the other hand to see if there is a difference in reaction time.

ACTIVITY 4: SPACE STATION

DAY: Motivational

MATHEMATICS PROFICIENCY/ INDICATOR: Develop solutions to problems.

MATERIALS: Art paper, pencils, crayons, used cans and bottles, scrap lumber, hammers, nails, scissors, transparent tape, twine (For hanging models)

DIRECTIONS: NASA has asked Congress for funding to design, construct, and launch into earth orbit by the 1990s, a large space structure (space station). You have been selected to work on one of the NASA decision-making teams. Your assignment and instructions are listed below. Congratulations and good luck on your appointment:

_____ 1. FUNCTION OF THE STATION.
Your duty is to decide what will be the function of this station in space. Should it be military or nonmilitary? This and other questions will need to be answered.

_____ 2. NATIONALITY OF SPACE STRUCTURE INHABITANTS.
Should this station be operated solely by Americans or should this be an international work station? Your decision must be supported by statements explaining why.

_____ 3. STAFFING OF THE LARGE SPACE STRUCTURE.
Your task is to select a group of people to operate the space structure and to explain why these people were selected. A list of possible candidates will be provided. (Sheet Attached)

_____ 4. DESIGN, CONSTRUCT, AND PLACE YOUR STRUCTURE IN SPACE.
Your report should include a drawing and description of the structure shape; a listing of materials used in construction; a step-by-step report on how the structure will be placed in space and where it should be placed. Any other pertinent data to successfully complete your part of the task should also be included.

_____ 5. BUILD A MODEL OF THE STRUCTURE.

ACTIVITY 5: PULSE RATE TEST

DAY: Motivational

SCIENCE PROFICIENCY/ INDICATOR: Describe applications of science.

MATERIALS: Chart for recording pulse rate (below), pencils, and a step approximately 18 inches high.

DIRECTIONS: Astronauts must be in good physical condition to fly in space. To give students an understanding of some of the activities astronauts use to stay fit, let them check their pulse rate under various conditions.

1. Divide the class into teams. Have students take their partner's pulse rate at rest and record it for future reference. The teacher may need to assist the students in the beginning, so the proper technique is used when the pulse rate is taken.

2. Have students climb up onto the step and down again at a rapid rate for two or three minutes--approximately 20 times.

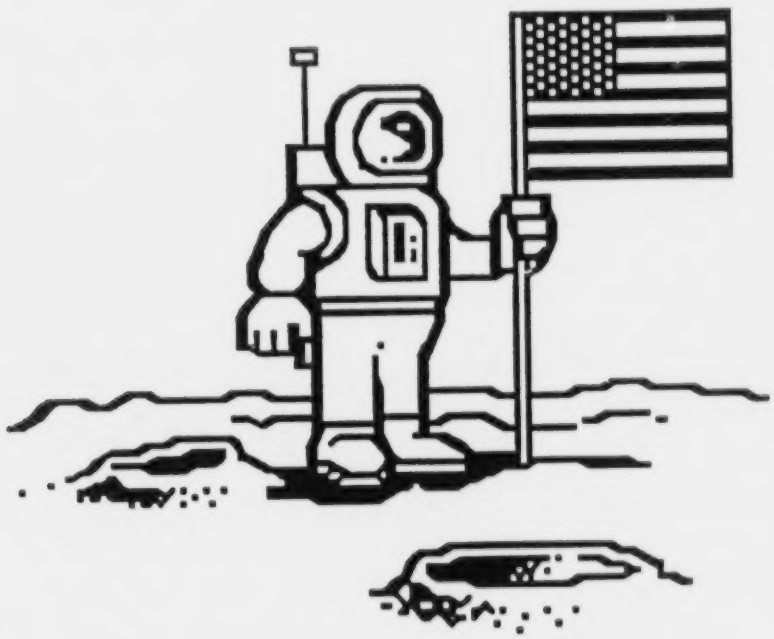
3. Have students take their partner's pulse rate again after the exercise; record and compare to pulse rate at rest.

4. Wait three minutes; again take pulse and record it. Repeat after five minutes. Compare to the previous pulse rates.

PULSE RATE CHART

Name	At rest	Immediately following exercise	3 min. after exercise	5 min. after exercise
1.				
2.				
3.				
4.				
5.				
6.				

ACTIVITY 6:	BACKGROUND INFORMATION ON SPACEFLIGHT
DAY:	Motivational
LANGUAGE ARTS PROFICIENCY/ INDICATOR:	Understand and bring meaning to the words, phrases, and sentences they encounter in their reading.
MATERIALS:	One copy of the following information.
DIRECTIONS:	Teacher divides class into cooperative groups. Students read material in the group. Use three-level study guide to interpret material.



HISTORY OF HUMAN SPACEFLIGHT

Manned spaceflight, popular in fiction, possible in theory, became fact on April 12, 1961, when the Russians launched Cosmonaut Yuri Gargarin into orbit. This was the first successful human spaceflight. Cosmonaut Gargarin made a 108-minute orbital flight around the Earth.

The space race actually became reality in 1957 when the Russians launched the first artificial satellite called Sputnik 1. The launching of Sputnik 1 on October 4, 1957, gave the United States its final incentive to organize an agency to direct spaceflight. The National Aeronautics and Space Administration (NASA) was activated into existence on October 1, 1958, by Congress. With NASA to direct its efforts, the United States race for space was on.

Both the United States and Russia sent nonhuman passengers into space before allowing the launching of men. On November 3, 1957, Russia launched Sputnik 2, containing a dog called Laika. In January 1961, NASA launched chimpanzees, "Baker," and "Abel," into suborbital flight. These flights proved that a living creature could travel into space and be returned safely to Earth.

The first United States manned space program was called Mercury. The program was named after the famous winged messenger of the gods.

The first American in space was Alan B. Shepard, with a 15 minutes, 22 second suborbital flight on May 5, 1961. There was one more suborbital flight, the following July 21, by Virgil I. Grissom. Twenty days after Shepard's flight, President John F. Kennedy announced the lunar landing program (Apollo) as a national goal to be accomplished during that decade (before 1970).

The objectives of the Mercury program were: to orbit a manned spacecraft around the earth; to investigate our ability to function in space; and to recover both man and spacecraft safely.

On February 20, 1962, the objectives of Project Mercury were achieved when Astronaut John H. Glenn, Jr., became the first American to orbit the earth. Glenn completed three orbits of the earth and was in space for 4 hours, 55 minutes, and 23 seconds. There were three more spaceflights in the Mercury program. The Mercury project came to an end with the 34-plus hour mission of Gordon Cooper in May 1963, on Mercury 9.

The next human spaceflight program was called Gemini (twins). This two-man spacecraft program was named after the third constellation of the Zodiac with its twin stars, Castor and Pollux.

The major objectives of this program were: to subject men and equipment to spaceflight up to two weeks in duration; to rendezvous and dock with other orbiting vehicles; to maneuver the docked combination by using the target vehicle's propulsion system; and to perfect methods of reentering the atmosphere and landing at a preselected point on land.

All of the objectives in this program were met except the landing on land. This was cancelled in 1964 when development problems began to have impact on the programs.

The first Gemini flight occurred on March 23, 1965, with Astronauts Virgil Grissom and John Young aboard. They made three orbits of the earth. The Gemini 4 mission on June 3, 1965, saw Astronaut Ed White become the first American to walk in space. White stayed outside his spacecraft for 21 minutes. There were a total of 10 flights in the Gemini program. This program ended on November 2, 1966, with the Gemini 12 flight. Astronaut Edwin "Buzz" Aldrin set a Gemini record for extravehicular (EVA) activity on this flight: 5 hours and 30 minutes of total EVA time.

It is important to note that during the Gemini program, the Soviets were also making strides in their human spaceflight program. On June 16, 1963, Junior Lieutenant Valentina Tereshkova became the first woman in space.

The Apollo program was NASA's greatest achievement. This program was designed to take three astronauts to the moon and allow two of them to land on its surface.

The major objectives of the Apollo program were: to establish the technology to meet other national interests in space; to carry out a program of scientific exploration of the moon; and to develop our capability to work in the lunar environment.

The program required development of two new spacecraft, one of them capable of landing on and taking off from the moon. It also required a launch rocket that could lift almost 7.5 mission pounds, a package of complex scientific experiments that could be deployed by two persons, and a vehicle to extend the surface exploration.

On January 27, 1967, a fire on the launch pad in a simulation prior to flight killed Astronauts Grissom, White, and Chaffee, and brought the program to a standstill. The inquiry into the causes of this tragedy lasted two and one-half months.

However, this inquiry led to a more fireproof spacecraft. A new quick-opening hatch cover and other designs and procedural changes were made. These included greatly reducing the proportion of oxygen in the capsule, so the astronauts would breathe a mixture of approximately 60 percent oxygen and 40 percent nitrogen, rather than the former mixture that included a much higher proportion of oxygen which supports burning.

There were ten Apollo flights to the moon with six lunar landings. NASA had intended to make ten lunar landings, but a ruptured service module oxygen tank on Apollo 13 prevented it from landing on the moon. Budget cuts caused NASA to eliminate the last two planned landings.

On July 20, 1969, Apollo 11 landed on the lunar surface. Astronaut Neil Armstrong became the first human to step onto the moon.

On July 26, 1971, the Apollo 15 mission carried a battery-powered lunar vehicle which enabled the astronauts to travel a greater distance from their lunar module to collect samples. There were a total of three Lunar Rover Vehicles used on the moon. All three were left on the moon's surface.

The 12 Americans who left their footprints in the lunar dust totaled 166 man-hours of surface exploration. They traveled almost 60 miles and brought 850 pounds of rock and soil samples back to earth. They left 60 major scientific experiments on the moon and conducted 34 more in lunar orbit.

Skylab, America's first space station, was launched without passengers on May 14, 1973.

Skylab was built from the third stage of a Saturn V rocket. The hydrogen tank on the third stage was converted into a spacious two-story accommodation for a three-man crew. The bottom section contained a wardroom, sleep compartments, and a washroom/toilet or "waste compartment." Above was the spacious workshop in which the astronauts could "swim" in a microgravity environment. The space station had about 11,700 cubic feet of room, approximately the same as a small two-bedroom house.

There was a total of three flights in Skylab. The astronauts stayed for 28 days, 59 days, and 84 days. A variety of experiments were conducted by the astronauts while on board Skylab.

Sixty-three seconds after liftoff, the heat meteoroid shield around Skylab was ripped away. One solar ray panel was lost and the other damaged. This delayed the launch of the first crew to Skylab for 11 days, so repair techniques could be developed and tested before astronauts docked with the station.

The third Skylab crew's time in the station was extended from 56 days to 84 days, so the crew might observe and study comet Kohoutek up close. This crew set a record for time for American astronauts in space--84 days.

The third and final manned Skylab mission ended with a splashdown in the Pacific Ocean on February 8, 1974. The space station reentered the earth's atmosphere over five years later, at 12:37 p.m. EDT, July 11, 1979, near southeastern Australia. After over six years in space, the demise of the orbital workshop came on its 34,981st orbit.

A fitting conclusion to the Apollo-type mission was completed on July 24, 1975, with the completion of the Apollo-Soyuz Test Project (ASTP).

The primary ASTP mission objectives were: rendezvous and docking; crew transfer, and control center-crew interaction.

The mission plan was for a Russian Soyuz spacecraft with two cosmonauts aboard to be launched, and seven and one-half hours later a Saturn 1B was launched with three astronauts on board. Two days after launch, the two spacecraft docked together in space. During the next two days, the crews accomplished four transfer operations between the two spacecraft and completed five scheduled experiments. In addition, the crews provided television views of the interiors of the two spacecraft and demonstrated various aspects of space operations.

This mission marked the first time that voice, TV, and telemetry data transmission were relayed between an orbiting Apollo spacecraft and the ground via the ATS-6 communications satellite.

Even before the giant Saturn V vehicles had completed their mission of sending astronauts to explore the moon, the need for a less expensive large launch vehicle had become obvious. In an effort to lower costs, NASA chose to employ a dramatically different concept, a reusable space vehicle. Hence the birth of the Space Shuttle, or Orbitor--a craft that takes off like a rocket, flies in space like a spacecraft, but returns to the earth and lands like a glider.

The big advantage is the reusability of the Orbiter. NASA engineers plan to reuse each Orbiter for at least 100 missions.

The first flight of the Shuttle (named Columbia) occurred on April 12, 1981, with Astronauts John Young and Robert Crippen at the controls. The vehicle completed 35.6 orbits of the earth and landed safely at Edwards Air Force Base in California. The first four flights of the Shuttle were test flights, designed to check out the performance of the spacecraft. The second Shuttle flight became the first time a previously flown piloted space vehicle was reused.

The first operational flight of the Shuttle was the Space Transport System (STS) 5 mission, launched on November 11, 1982. It was the first time four astronauts had been launched in one vehicle. Two commercial communications satellites were launched from the payload bay of the Shuttle.

On April 4, 1983, the second Shuttle Orbiter, Challenger, was launched with the STS-6 flight. Astronaut Story Musgrave tested a new spacesuit by doing an EVA in the cargo bay.

On June 18, 1983, STS-7 carried the first American woman into space--Dr. Sally Ride. Dr. Ride, a mission specialist, and four other crew members performed tasks with the remote manipulator arm.

Astronaut Guion Bluford, on August 30, 1983, became the first American black astronaut to fly in space, aboard STS-8. A total of six people made up this crew. The Shuttle for the first time was launched at night and returned to the earth at night.

Spacelab, a European-made scientific lab, was flown for the first time aboard STS-9. The first non-NASA American astronaut, Ulf Merbola from West Germany, flew with Spacelab.

There are many more flights scheduled for the Shuttle through the 1990s.

The question many people ask is, "What's next in the space program?" President Ronald Reagan, on January 25, 1984, committed this country to build and launch into earth orbit a large space structure (space station) by the early 1990s. This will probably accommodate six to eight people from six months up to a year. These space station crew members will have a variety of tasks to perform while in orbit, in addition to building the structure itself, in which many experiments and research projects can be conducted.

There has been talk of erecting a permanent lunar base on the moon's surface by approximately the year 2000. This base would be used for long-duration scientific research on the moon.

Probably, the next step for human spaceflight after the projects, such as the space station and the lunar base, will be a flight to the planet Mars.

Match the events listed below with the year in which the event occurred. Note: One of the dates can be used more than once.

(a)	1983	(e)	1971	(i)	1963	(m)	1974
(b)	1865	(f)	1959	(j)	1961	(n)	1968
(c)	1965	(g)	1962	(k)	1975		
(d)	1973	(h)	1981	(l)	1969		

_____ 1. Neil Armstrong and Edwin Aldrins, Jr., became the first people to set foot onto the moon's surface.

_____ 2. The Space Shuttle was launched for the first time with Astronauts John Young and Robert Crippen aboard.

_____ 3. Sally Ride was the first American woman to fly in space, aboard STS-7.

_____ 4. John H. Glenn, Jr., was the first American to orbit the earth. He completed three orbits in Friendship 7.

_____ 5. Edward White II made the first United States space-walk during the Gemini 4 mission.

_____ 6. The first American astronaut in space, Alan Shepard, made a 15-minute suborbital flight in Freedom 7.

_____ 7. Skylab, America's first space station, was launched, and three different crews worked and lived in a microgravity environment.

_____ 8. Apollo-Soyuz, the joint United States-Russian spaceflight was launched.

_____ 9. Gordon Cooper, Jr., flew on the last Mercury flight--Mercury 9.

_____10. The Lunar Rover Vehicle, the car used on the moon, was first used on Apollo 15.

_____11. Apollo 8 was the first flight to the moon. Astronauts were in orbit around the moon on Christmas Day.

_____12. The last crew of astronauts who visited Skylab splashed down in the Pacific Ocean on February 8.

_____13. Chimpanzees Abel and Baker flew in space to test the effects of weightlessness on living creatures.

_____14. Yuri Gagarin, Russian cosmonaut, became the first human to fly in space.

_____15. Jules Verne, in his novel, "De la Terre a la Lune" (From the Earth to the Moon), put his passenger into a huge aluminum bullet, fired toward the moon from a giant cannon buried in Florida soil.

THREE-LEVEL STUDY GUIDE

ME GROUP

Literal (Check the statements which clearly state what the author said.)

_____ _____ 1. NASA's greatest achievement was the Apollo program.

_____ _____ 2. Deaths have occurred in the space program.

_____ _____ 3. Each Orbiter will be used 100 times.

_____ _____ 4. Lunar means moon.

_____ _____ 5. The first Shuttle to orbit the Earth was the Discovery.

Interpretation (Check those items that represent what the author meant.)

_____ _____ 1. Interest in exploring space is not limited to a race or nationality of man.

_____ _____ 2. The future of the NASA space program is certain.

_____ _____ 3. NASA is careful to protect human life.

_____ _____ 4. Money is important to space exploration.

Application (Check the statements that reflect the ideas presented in the story)

_____ _____ 1. Man will continue to explore his universe.

_____ _____ 2. Risk is involved in all new endeavors.

_____ _____ 3. Acronyms and new words evolve to describe new scientific activities/information.

_____ _____ 4. Money drives man to search for new resources.

_____ _____ 5. Money is the root of all evil.

ACTIVITY 7: DOWN ON MARS

DAY: Motivational

SCIENCE PROFICIENCY/ INDICATOR: Propose solutions and use scientific information.

MATERIALS: List of items (sheet attached) to rank and a pencil

DIRECTIONS: You are a member of a Mars flight scheduled to land at a base on Mars on the lighted side of the planet. Due to mechanical difficulties, however, you and your partner were forced to land at a spot some 200 miles from the base, while the third member of the crew continued to orbit in the Command Ship. During the landing much of the equipment aboard was damaged, and since survival depends on reaching the Mars base, the most critical items available must be chosen for the 200-mile trip.

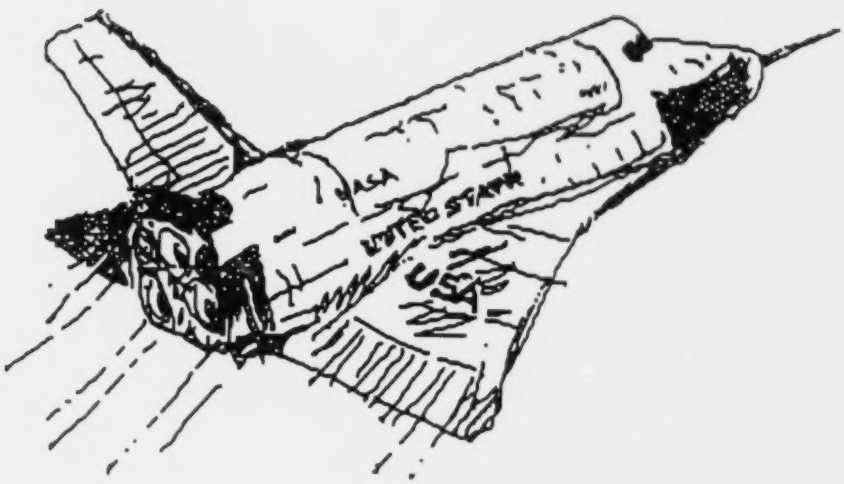
Below are listed the 15 items left intact and undamaged after landing. Your task is to rank-order them in terms of importance for your crew in allowing them to reach the Mars base. Place the number 1 by the most important item, the number 2 by the second most important, and so on through number 15, the least important.

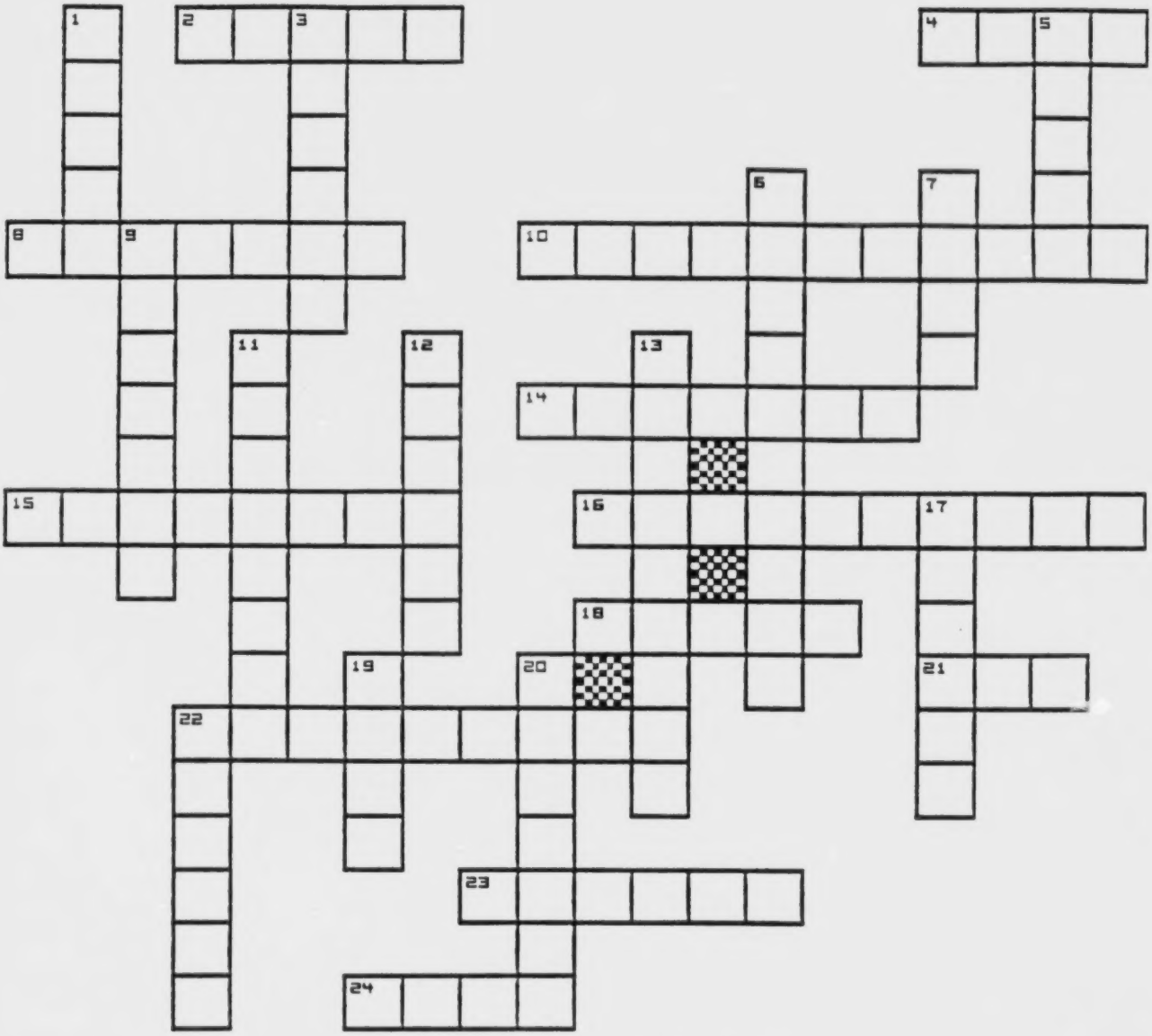
FOR TEACHER USE

ITEM	YOUR RANKING	GROUP RANKING	EXPERT RANKING
Box of matches			15
Food concentrate			4
50-feet nylon rope			6
Parachute			8
Portable heating unit			13
Sextant			11
Portable air conditioner			12
(2) 100 # tanks of oxygen			1
Mars constellation map			3
Pick and shovel			9
Magnetic compass			14
5 gallons of water			2
Self-igniting signal flares			10
First aid kit with hypodermic needles			7
Solar powered FM transceiver			5

Do not let students see expert rankings until they have individually and group ranked the 15 items in terms of their importance to the crew. Discuss why the NASA experts ranked them in this order.

ACTIVITY 8:	SPACE VOCABULARY CROSSWORD PUZZLE
DAY:	Motivational
LANGUAGE ARTS PROFICIENCY/ INDICATOR:	Use reading skills in content areas. Solve puzzles.
MATERIALS:	Puzzle, resource books
DIRECTIONS:	Students work in groups of two to solve puzzle.





CROSS CLUES

2. SUN
4. NATURAL SATELLITE
8. FATHER OF ROCKETING IN U.S.
10. FUEL
14. PULL OF THE EARTH
15. EARLY GERMAN ROCKET EXPERT
16. CIRCLE THE EARTH
18. CREATURE FROM ANOTHER GALAXY
21. UNIDENTIFIED FLYING OBJECT (ABR.)
22. PERSON TRAINED FOR SPACE EXPLORATION
23. A PROJECTILE UTILIZING ISAAC NEWTON'S THIRD LAW OF MOTION
24. EMPTINESS

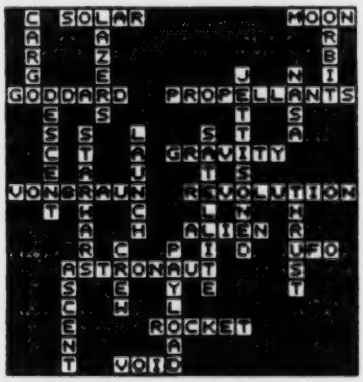
DOWN CLUES

1. EVERYTHING ON BOARD
3. LIGHT BEAMS FOCUSED
5. TRIP AROUND EARTH
6. FALLS TO EARTH
7. NATIONAL AERONAUTICAL SOCIETY OF AMERICA
9. DOWNWARD
11. SPEILBERG MOVIE
12. TO SEND OFF
13. CIRCLE THE EARTH
17. POWER OF A ROCKET
19. MEMBERS OF FLIGHT GROUP
20. CARGO ABOARD PAID FOR BY SPONSORS. I.E., EXPERIMENTS, SATELLITES
22. UPWARD

WORD LIST:

ALIEN
ASTRONAUT
ASCENT
CARGO
CREW
DESCENT
GODDARD
GRAVITY
JETTISONED
LAZERS
LAUNCH
MOON
NASA
ORBIT
PAYLOAD
PROPELLANTS
REVOLUTION
ROCKET
SATELLITE
SOLAR
STARWARS
THRUST
UFO
VONBRAUN
VOID

ANSWERS:



ACTIVITY 9: SOLAR SYSTEM

DAY: Motivational

SCIENCE PROFICIENCY/ INDICATOR: Analyze natural systems.

MATERIALS: Encyclopedias, space resources, computer, printer, data base software, graphics software, and/or word processing software

DIRECTIONS: Break students into small groups. Assign each group a planet in our solar system to investigate, research, and study. Each group should do all the activities listed below.

Data base applications

1. Report at least ten major findings about their planet.
2. List distances from Earth to their planet (and the other planets).
3. Calculate how long it would take to reach their planet on a spaceship (traveling at 25,000 miles an hour).

Word processing applications

1. Decide who will go on their spaceship (it carries six people) and what their responsibility will be.
2. Write or tell a story describing what life will be like on their planet.
3. Use this statement or reminder sentence to teach students names of the nine planets and their correct order in distance from the sun.

"Mary's violet eyes make John stay up nights, period."

Mary's	-	**Mars**
Violet	-	**Venus**
Eyes	-	**Earth**
Make	-	**Mercury**
John	-	**Jupiter**
Stay	-	**Saturn**
Up	-	**Uranus**
Nights	-	**Neptune**
Period	-	**Pluto**

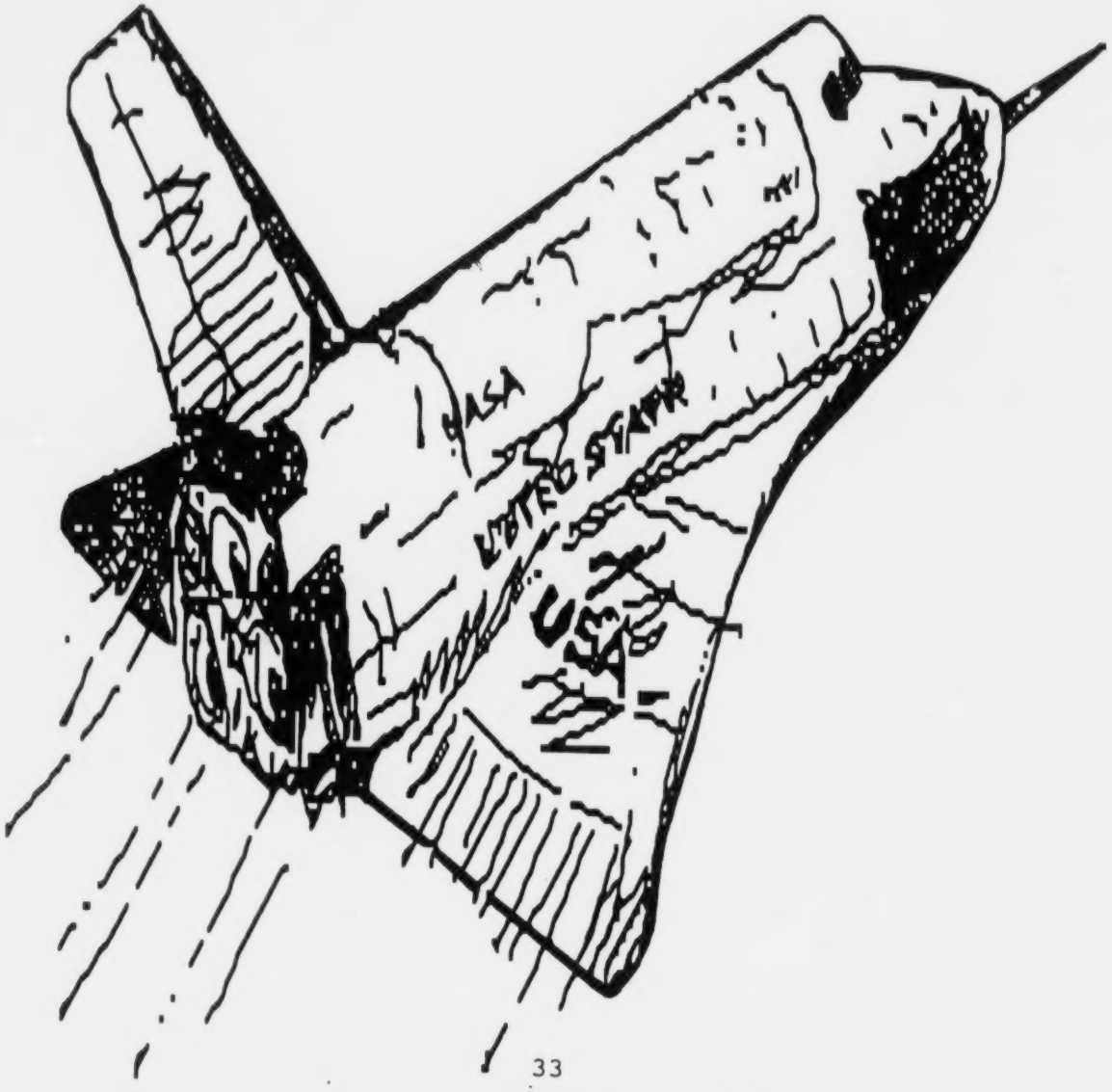
Graphics applications

1. Sketch our solar system which also shows where their planet is located.

2. Design a spaceship which will transport them to their planet.

INFORMATION

DAY



BEST COPY AVAILABLE

ACTIVITY 1: CREATIVE LETTER WRITING

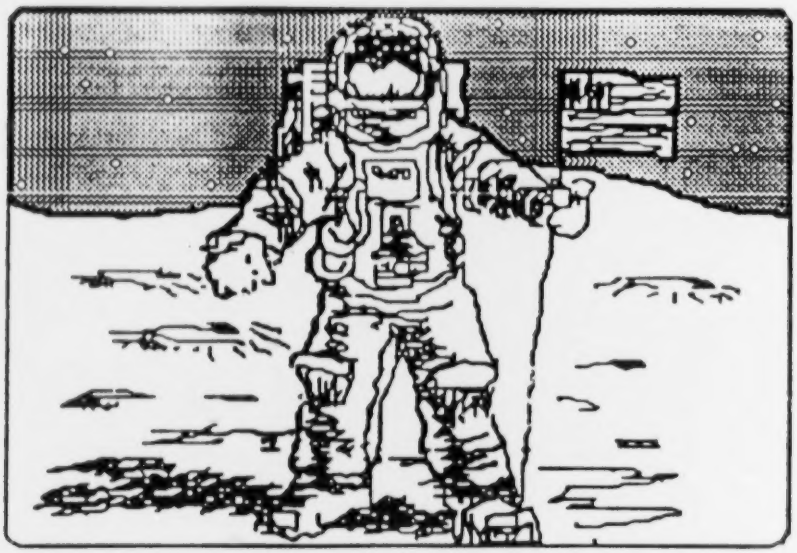
DAY: Information

LANGAUGE ARTS PROFICIENCY/ INDICATOR: Write personal letters to communicate ideas.

MATERIALS: Following Sheet

DIRECTIONS: Write a letter home describing your experiences from space. You can be in flight or on a planet. Draw a view of what you see in the porthole at the bottom.

P.S. Don't forget you need a comma after the greeting and closing!



ACTIVITY 2: STORY PROBLEMS

DAY: Information

MATHEMATICS PROFICIENCY/ INDICATOR: Develop strategies for solving problems (both routine and nonroutine) through translating relevant verbal and physical data into mathematical language.

MATERIALS: Human Spaceflight Log sheets (attached); computer, spread sheet program

DIRECTIONS: Enter the data from the Human Space Flight Log into a spread sheet. Solve these math problems by developing formulas in the spread sheet.

1. There were six Mercury flights. What was the total time spent in space by the astronauts on those flights?

2. Gemini 7 was the longest duration flight with a total of 330 hours, 35 minutes, 31 seconds. How many full days would this be?

3. How much more EVA time was used on Apollo 14 than Apollo 12?

4. Find the total number of pounds of rock samples returned to the earth by the Apollo missions.

5. How many more pounds of rock samples were returned on Apollo 15 than on Apollo 11 and Apollo 14 combined?

6. What is the total number of lunar orbits completed by all of the Apollo astronauts that stayed in the command modules?

7. Find the total time astronauts have spent on the moon.

Answers:

1. 53 hours, 55 minutes, 27 seconds
2. 13 full days
3. 1:78 (1 hour, 78 minutes)
4. 845.2 pounds
5. 25.5 pounds
6. 459
7. 299 hours, 35 minutes, 21 seconds

HUMAN SPACE FLIGHT LOG

Mission	Crew	Date	Duration hr:min:sec.	Remarks
Mercury-Redstone 3	Shepard	May 5, 1961	00:15:22	Suborbital flight--first American in space. USS Champlain, Atlantic recovery (A). Spacecraft call sign Freedom 7.
Mercury-Redstone 4	Grissom	July 21, 1961	00:15:37	Suborbital; successful flight but spacecraft sank, astronaut rescued. USS Randolph (A). Liberty Bell 7.
Mercury-Atlas 6	Glenn	Feb. 20, 1962	04:55:23	Three-orbit flight; first American in orbit; retropack retained when erroneous signal indicated heat shield possibly loose; capsule landed 40 miles uprange. USS NOA (A). Friendship 7.
Mercury-Atlas 7	Carpenter	May 24, 1962	04:56:05	Also three-orbit mission; yaw error at manual retrofire caused 250-mile landing overshoot. USS Pierce (A). Aurora 7.
Mercury-Atlas 8	Schirra	Oct. 3, 1962	09:13:11	Six-orbit flight; capsule landed 4.5 miles from recovery ship USS Kearsarge, Pacific (P). Sigma 7.
Mercury-Atlas 9	Cooper	May 15-16, 1963	34:19:49	Twenty-two orbits to evaluate effects on man of 1 day in space; landed 4.5 miles from USS Kearsarge (P). Faith 7.
Apollo-Saturn 7	Schirra, Eisele, Cunningham	Oct. 11-22, 1968	260:09:03	First manned flight of Apollo spacecraft command-service module only. Spacecraft splashed down within 10 miles of predicted landing point.
Apollo-Saturn 8	Borman, Lovell, Anders	Dec. 21-27, 1968	147:00:42	First flight to moon. Views of lunar surface televised to earth.
Apollo-Saturn 9	McDivitt, Scott, Schweickart	March 3-13, 1969	241:00:54	First manned flight of lunar module; Schweickart 37-minute EVA from LM; 151 rvs; USS Guadalcanal (A).
Apollo-Saturn 10	Stafford, Young, Cernan	May 18-26, 1969	192:03:23	First lunar module orbit of moon; 31 revs of moon (4 revs by undocked LM).
Apollo-Saturn 11	Armstrong, Collins, Aldrin	July 16-24, 1969	195:18:35	First lunar landing; lunar stay time 21 hours 36 minutes 21 seconds, Armstrong and Aldrin EVA 2 hours 31 minutes 40 seconds, lunar surface samples 48.5 pounds; 30 revs.

Apollo-Saturn 12	Conrad, Gordon, Bean	Nov. 14-24, 1969	244:36:25	Stay time 31 hours 31 minutes, Conrad and Bean EVA's 3 hours 56 minutes and 3 hours 49 minutes, lunar samples 74.7 pounds (P).
Apollo-Saturn 13	Lovell, Swigert, Haise	Apr. 11-17, 1970	142:54:41	Mission aborted after service module oxygen tank ruptured; crew returned safely to earth.
Apollo-Saturn 14	Shepard, Roosa, Mitchell	Jan. 31-Feb. 9, 1971	216:01-57	Stay time 33:31, Shepard and Mitchell EVAs 4:48 and 4:35, samples 96 pounds; 34 revs; (P).
Apollo-Saturn 15	Scott, Worden, Irwin	July 26 - Aug. 7, 1971	295:11:53	First use of lunar roving vehicle; stay time 66:55; Scott standup EVA 33 minutes, Scott and Irwin EVAs 6:33, 7:12, and 4:50, Worden trans-earth EVA 38 min, samples 170 pounds; 74 revs.
Apollo-Saturn 16	Young, Mattingly, Duke	Apr. 16-27, 1972	265:51:05	Stay time 71:02; Young and Duke EVAs 7:11, 7:23 and 5:40, Mattingly trans-earth EVA 1:24, samples 213 pounds, 64 revs.
Apollo-Saturn 17	Cernan, Evans, Schmitt	Dec. 7-19, 1972	301:51:59	Stay time 75:00; Cernan and Schmitt EVAs 7:12, 7:37 and 7:15, Evans trans-earth EVA 1:06, samples 243 pounds; 75 revs.

ACTIVITY 3:	DRESSED FOR SPACE
DAY:	Information
LANGUAGE ARTS PROFICIENCY/ INDICATOR:	Understand and bring meaning to the words, phrases, and sentences they encounter in their reading.
	Understand and bring meaning by recognizing and recalling details, main ideas, etc.
MATERIALS:	One copy of attached story
DIRECTIONS:	Teacher reads questions with students on last page.
	Students read silently/answer questions.
	Class discusses article.

DRESSED FOR SPACEFLIGHT

Space is hostile and deadly to the unprotected human because it lacks the atmospheric pressure, oxygen, and temperature control to sustain life. Without the filtering effects of the Earth's atmosphere, the sun's heat can raise the temperature of an object in space to as high as 250 degrees Fahrenheit, and can lower the temperature to as low as 250 degrees below zero in the shadow.

The first pressure suit or spacesuit was designed to be worn by Wiley Post (1934), a world-renowned aviator who was attempting to set a high-altitude record in an airplane. The suit designed and built for Post resembled the type usually worn by deep-sea divers.

MERCURY

One of the first true spacesuits was developed for the Mercury program. It was designed after the U.S. Navy's Mark IV pressure suit which was used in high-speed flight. The suit was worn in case the spacecraft's environmental control system failed. The Mercury spacecraft's design played a large role in the development of the suit eventually worn during a mission.

The interior of the spacecraft was small, and the design of the craft's controls was such that mobility was not a prime requirement except for shoulder and hand movement. With the short-duration flights, waste management could be achieved by proper preflight diet and the use of a urine collection device in the suit.

In the Mercury suit, oxygen was fed into the garment by a connector located in the torso area. The oxygen was first circulated to the extremities of the suit and then to the helmet for breathing. Exhaled waste bled off through a headpiece connector into the environmental control system where it was reconstituted for reuse.

The suit was usually made of four layers of loosely fitted materials. The outer layer was a high-temperature-resistant metallic fabric. The second layer was a woven net fabric which served as a restraint layer to prevent the suit from ballooning when pressurized. The third layer was a rubberized fabric designed to make the suit airtight. The inner layer next to the astronaut's body was a smooth, soft nylon designed for comfort.

The helmet for the spacesuit, attached to a special neck ring, was padded to prevent head injury. The astronaut's communications systems were built into the helmet. Gloves and custom-made boots completed the spacesuit.

GEMINI

In the two-man spaceflight program, Gemini, NASA faced the problem of developing a fully pressurized spacesuit that would allow a member of the crew to leave the spacecraft for varying lengths of time and to operate in a microgravity environment of extreme temperature differences.

The basic Gemini suit had some similarity to the Mercury suit. It was a multilayered garment consisting of an inner comfort liner, a gas bladder, a structural restraint layer, and an outer protective cover. To make the suit easier to put on and take off, quick disconnectors were located at the wrists for gloves, at the neck for the helmet, and at the waist for ventilation-gas connections.

A pressure-sealing zipper was added to make dressing and undressing easier. Body wastes were taken care of by a disposal system built into the suit. The basic suit was also provided with handkerchief, pencils, survival knife, scissors, neck and wrist dams (worn during recovery operations after gloves and helmet have been removed to prevent water from entering the suit), a parachute harness, and special built-in pockets on the arms and legs to hold flight books and charts.

On the Gemini 4 mission, an astronaut left the spacecraft to become the first American to walk in space. For this new experience, the suit had to be slightly modified. A different extravehicular (EVA) outer layer was added to the basic suit as well as pressure-thermal gloves, a helmet visor with temperature control coating, and a sun visor. The EVA outer layer consisted of nylon material for micrometeoroid protection, seven layers of aluminized superinsulation, and an outer covering of high-temperature-resistant nylon cloth.

An additional change in the Gemini spacesuit was made for the Gemini 7 flight. A "lightweight" suit was designed for use within the spacecraft only. Its purpose was to provide maximum protection as well as comfort and freedom of movement.

The suit had a soft fabric hood which replaced the hard preshaped helmet worn previously. The lightweight suit weighed only 16 pounds.

The new suit had two layers of material: the inner layer was the pressure-restraining, neoprene-coated nylon bladder, and the outer layer was 6-ounce, high-temperature-resistant nylon. The new suit made it possible to travel in a shirt-sleeve environment.

Other changes in the Gemini spacesuit occurred on Gemini 8. The outer protective cover, or micrometeoroid layer, was reduced. On Gemini 9, changes were made in the lower portion of the Astronaut Maneuvering Unit (AMU).

APOLLO

The Apollo spacesuit had to provide the astronauts with protection. It had to protect them from temperatures ranging from -250 to +250 degrees F. Not only did the moon explorers' spacesuits have to offer protection from jagged rocks and the searing heat of the lunar day, but the suit also had to be flexible enough to permit stooping and bending as the crewmen gathered samples from the Moon.

A backpack, portable life-support system, provided breathing oxygen, suit cooling, and pressurization for moonwalks lasting up to eight hours.

The Apollo space suit's mobility was improved over earlier suits by the use of bellows-like joints at the elbows and knees.

From the body out, the Apollo spacesuit began with a liquid-cooling garment similar to a pair of long underwear with a network of spaghetti-like tubing sewn into the fabric. Cool water, circulated through the tubing, transferred the body heat from the astronaut's body to the backpack and, thence, to space.

Next, was a layer of lightweight, heat-resistant nomex, followed by a gas-tight bladder of Neoprene-coated nylon, a nylon restraint layer to prevent the bladder from ballooning, a lightweight, super-insulation of alternating layers of thick Kapton and glassfiber cloth, several layers of Mylar and space material, and finally, protective outer layers of Teflon-coated, glassfiber Beta cloth and Teflon cloth. The suit had a total of 21 layers of material in its makeup.

The Apollo helmet was formed from high-strength, Lexan plastic, and was attached to the spacesuit by a pressure-sealing neck ring. Unlike the Mercury and Gemini helmets, the Apollo helmet was fixed and the astronaut's head was free to move about inside. While walking on the moon, Apollo astronauts wore an outer visor over the bubble helmet to shield against eye-damaging, ultraviolet radiation.

SKYLAB

Skylab astronauts wore a simplified version of the Apollo spacesuit. The changes in the suit included a lightweight thermal micrometeoroid overgarment, elimination of the lunar boots, and a simplified visor shell over the helmet. An umbilical life-support cord replaced the backpack during spacewalks.

APOLLO-SOYUZ

Apollo-type spacesuits were used again for the joint Apollo-Soyuz Test Project. The astronauts were equipped with an Apollo spacesuit fitted with a simple cover layer replacing the thermal micrometeoroid layer, since no spacewalks were planned. The cosmonauts had "skafandr" available in the event of pressure-loss in the spacecrafts.

SPACE SHUTTLE

After the first four Shuttle flights, spacesuits are no longer required to be worn during liftoff or reentry as on earlier space missions. Spacesuits are required if an extravehicular activity is planned. The Shuttle spacesuits come in three sizes -- small, medium, and large. The suits are designed to accommodate both male and female astronauts. No longer are suits tailored for individuals as in earlier programs.

To put on the spacesuit, the Shuttle astronaut enters an airlock drum where the suit is stored. First he or she puts on a pair of long johns and a urine-collecting device. The long johns have water-cooling tubes running through them to keep the wearer comfortable during the heavy outside work. Next, he/she "rises" into the top section of the two-piece suit fastened to the wall and then gets into the lower part.

The Shuttle spacesuit is a remarkable feat of engineering. A built-in backpack in the upper section contains a miniature life-support system similar to the Shuttle's system. The backpack contains oxygen for circulation through the helmet and the inside layer of the spacesuit, a fan to move the air, a small lithium hydroxide canister with a layer of charcoal to remove carbon dioxide and other unwanted gasses, water and a pump to dispatch it into the tubes in the long johns, a unit to cool the water and get rid of the heat from the astronaut's body, and batteries to power it. There is even a water purifier, so drinking water can be sipped inside the helmet.

The suit has a series of layers. The basic layer is an inflatable bladder that is filled with oxygen to create a uniform pressure around the body. A restraint layer of dacron-polyester over the bladder prevents it from ballooning. Next, are several layers of fireproof fabric and flexible metal to provide insulation against radiation and temperature changes in space. A layer of hard metal joins the top and bottom sections of the spacesuit into a unit.

A new and exciting piece of equipment has been added to the Shuttle spacesuit. It is called a Manned Maneuvering Unit (MMU). The MMU is a one-person, gas-propelled backpack that snaps onto the spacesuit's portable life support system. Rotational and translational hand controllers allow the crewmember to fly with precision in or around the Shuttle's payload bay or to nearby free-flying payloads or structures, and to reach many otherwise inaccessible areas outside the orbiter.

The "Dressed for Spaceflight" unit will help you find the answers to these questions.

1. Who was the first pressure suit designed for?_____

_____

2. How many layers are there in a Mercury suit?_____

_____

3. What was added to the Gemini suit which made it easier to put on and take off?_____

_____

4. Why did the spacesuit on Gemini 4 have to be modified?_____

_____

5. When was the Gemini "lightweight" suit first used?_____

_____

6. What did the Gemini "lightweight" suit allow the astronauts to do?_____

_____

7. The Apollo spacesuits had to be flexible enough to allow the astronauts_____ and

_____

8. How long could astronauts stay out on the moon?_____

_____

9. In the Apollo spacesuit, what purpose did the long johns serve?_____

10. How many layers did the Apollo suits contain?_____

11. Why was an outer visor worn over the helmet during moon walks?_____

_____

12. What was eliminated from the Apollo-type suit for Skylab missions?_____

_____

13. Why was it eliminated?_____

_____

ACTIVITY 4: SPACE SHUTTLE MENU

DAY: Information

HEALTH PROFICIENCY/ INDICATOR: Apply health knowledge and skills. Use technological information.

MATERIALS: Foods eaten by astronauts

The kinds of foods the Space Shuttle astronauts eat are not mysterious concoctions, but common everyday foods prepared here on Earth. Many are commercially available on grocery store shelves. Diets are designed to supply each crew member with all the recommended dietary allowances of vitamins and minerals necessary to perform in the environment of space.

The standard Shuttle menu repeats after seven days. It supplies each crew member with three balanced meals, providing 2,800 kilo-calories each day. Each astronaut's food is stored aboard the Orbiter and identified by a colored dot affixed to each package.

SUGGESTED ACTIVITIES:

1. Have students work in teams or individually to develop a four-day menu for a Shuttle flight, using the list of Shuttle foods provided on the next few pages.

2. Let them compare their four-day menus with the one provided by NASA.

3. Have the students discuss the importance of a well-balanced menu.

4. Why is it important to have a variety of foods to select from?

5. Have students make a list of other foods which could possibly be carried on a Shuttle flight.

6. Allow students to select several items from the contingency/ pantry foods to be eaten as snacks.

FOOD TYPES AND PREPARATION REQUIREMENTS

Food types	Packages	Preparation requirements
Fresh - Fruits (apples, oranges, bananas, etc.), vegetable sticks (carrots, celery), bread, breakfast rolls, and cheese	Fruits - without wrappers Vegetable sticks - plastic zip-lock bags Bread, breakfast rolls and cheese - original manufacturer wrapper	Ready-to-eat
Thermostabilized - Thermal/ heat-processed foods canned or packaged in laminated foil pouches (cheese spread, tuna, beef with barbecue sauce, etc.)	Cans	Heat (if required) and remove easy-open full-panel pullout lid or open with can opener
	Foil-backed plastic pouches	Heat (if required), cut open with scissors
Rehydratable food - Dehydrated food reconstituted with water (scrambled eggs, beef patty, chicken and noodles, etc.)	Plastic container	Rehydrate, heat (if required), cut open with scissors or knife
Rehydratable beverages (coffee, lemonade, orange drink, etc.)	Plastic container	Rehydrate, heat (if required), drink from the rehydration valve using a plastic straw with probe, which is inserted in the valve
Irradiated - Foods exposed to ionizing radiation for preservation (meats, etc.)	Foil-backed plastic pouch	Heat (if required), cut open scissors
Intermediate moisture - Foods preserved by controlling the moisture (dried apricots, peaches, etc.)	Plastic pouch (bite size)	Cut open with scissors (ready-to-eat)
Natural form (nuts, cookies, etc.)	Plastic pouch	Cut open with scissors (ready-to-eat)

The menu food items for a typical crewmember-day requires approximately 20 packages consisting of the following food types:

- 4 to 7 rehydratables
- 1 to 4 thermostabilized or irradiated
- 8 beverages
- 4 ready-to-eat

SPACE SHUTTLE FOOD AND BEVERAGE LIST

FOODS *

Applesauce (T)
Apricots, dried (IM)
Asparagus (R)
Bananas (FD)
Beef almondine (R)
Beef, corned (I) (T)
Beef and gravy (T)
Beef, ground w/pickle sauce (T)
Beef jerky (IM)
Beef patty (R)
Beef, slices w/barbeque sauce (T)
Beef steak (I) (T)
Beef stroganoff w/noodles (R)
Bread, seedless rye (I) NF)
Broccoli au gratin (R)
Breakfast roll (I) (NF)
Candy, Life Savers®, assorted flavors (NF)
Cauliflower w/cheese (R)
Cereal, bran flakes (R)
Cereal, cornflakes (R)
Cereal, granola (R)
Cereal, granola w/blueberries (R)
Cereal, granola w/raisins (R)
Chedder cheese spread (T)
Chicken a la King (T)
Chicken and noodles (R)
Chicken and rice (R)
Chilli mac w/beef (R)
Cookies, pecan (NF)
Cookies, shortbread (NF)
Crackers, graham (NF)
Eggs, scrambled (R)
Food bar, almond crunch (NF)
Food bar, chocolate chip (NF)
Food bar, granola (NF)
Food bar, granola/raisin (NF)
Food bar, peanut butter/ granola (NF)
Frankfurters (Vienna sausage) (T)
Fruitcake (NF)
Fruit cocktail (T)
Green beans, french w/mushrooms (R)
Green beans and broccoli (R)
Ham (I) (T)
Jam/Jelly (T)
Macaroni and cheese (R)
Meatballs w/barbeque sauce (T)
Nuts, almonds (NF)
Nuts, cashews (NF)
Nuts, peanuts (NF)
Peach ambrosia (R)
Peaches, dried (IM)
Peaches, (T)
Peanut butter
Pears (FD)
Pears (T)
Peas w/butter sauce (R)
Pineapple, crushed (T)
Pudding, butterscotch (T)
Pudding, chocolate (R) (T)
Pudding, lemon (T)
Pudding, vanilla (R) (T)
Rice pilaf (R)
Salmon (T)
Sausage patty (R)
Shrimp creole (R)
Shrimp cocktail (R)
Soup, cream of mushroom (R)
Spaghetti w/meatless sauce (R)
Strawberries (R)
Tomatoes, stewed (T)
Tuna (T)
Turkey and gravy (T)
Turkey, smoked/sliced (I) (T)
Turkey tetrazzini (R)
Vegetables, mixed Italian (R)

BEVERAGES

Apple drink
Cocoa
Coffee, black
Coffee w/cream
Coffee w/cream and sugar
Coffee w/sugar
Grape drink
Grapefruit drink
Instant breakfast, chocolate
Instant breakfast, strawberry
Instant breakfast, vanilla
Lemonade
Orange drink
Orange-grapefruit drink
Orange-pineapple drink
Strawberry drink
Tea
Tea w/lemon and sugar
Tea w/sugar
Tropical punch

CONDIMENTS

Barbeque sauce
Catsup
Mustard
Pepper
Salt
Hot pepper sauce
Mayonnaise

* Abbreviations in parentheses indicate type of food: T = thermostabilized, I = irradiated, IM = intermediate moisture, FD = freeze dried, R = rehydratable, and NF = natural form.

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Typical Menu for the First Four Shuttle Flights, * (**)

DAY 1	DAY 2	DAY 3	DAY 4
Peaches (T)	Applesauce (T)	Dried peaches (IM)	Dried apricots (IM)
Beef patty (R)	Beef jerky (NF)	Sausage (R)	Breakfast roll (I) (NF)
Scrambled eggs (R)	Granola (R)	Scrambled eggs (R)	Granola w/blueberries (R)
Bran flakes (R)	Breakfast roll (I) (NF)	Cornflakes (R)	Vanilla instant breakfast (B)
Cocoa (B)	Chocolate, instant breakfast (B)	Cocoa (B)	Grapefruit drink (B)
Orange drink (B)	Orange-grapefruit drink (B)	Orange-pineapple drink (B)	
Frankfurters (T)	Corned beef (T) (I)	Ham (T) (I)	Ground beef w/pickle sauce (T)
Turkey tetrazzini (R)	Asparagus (R)	Cheese spread (T)	Noodles and chicken (R)
Bread (I) (NF)	Bread (I) (NF)	Bread (I) (NF)	Stewed tomatoes (T)
Bananas (FD)	Pears (T)	Green beans and broccoli (R)	Pears (FD)
Almond crunch bar (NF)	Peanuts (NF)	Crushed pineapple (T)	Almonds (NF)
Apple drink (B)	Lemonade (B)	Shortbread cookies (NF)	Strawberry drink (B)
		Cashews (NF)	
		Tea w/lemon and sugar (B)	
Shrimp cocktail (R)	Beef w/barbeque sauce (T)	Cream of mushroom soup (R)	Tuna (T)
Beef steak (T) (I)	Cauliflower w/cheese (R)	Smoked turkey (T) (I)	Macaroni and cheese (R)
Rice pilaf (R)	Green beans w/mushrooms (R)	Mixed Italian vegetables (R)	Peas w/butter sauce (R)
Broccoli au gratin (R)	Lemon pudding (T)	Vanilla pudding (T) (R)	Peach ambrosia (R)
Fruit cocktail (T)	Pecan cookies (NF)	Strawberries (R)	Chocolate pudding (T) (R)
Butterscotch pudding (T)	Cocoa (B)	Tropical punch (B)	Lemonade (B)
Grape drink (B)			

* Abbreviations in parentheses indicate type of food: T = thermostabilized, I = irradiated, IM = intermediate moisture, FD = freeze dried, R = rehydratable, NF = natural form, and B = beverage.

** Beginning with the fifth Shuttle flight, the menu cycle will be enlarged to six days.

SAMPLE CONTINGENCY/PANTRY

Beverages (166)

Apricot-peach drink	7
Citrus drink	7
Cocoa	10
Coffee (B)	16
Coffee (S)	8
Coffee (C and S)	20
Grapefruit drink	7
Instant breakfast, chocolate	2
Instant breakfast, vanilla	2
Lemonade	21
Orange juice mix	20
Orange-mango drink	25
Tea	7
Tea w/lemon and artificial sweetener	14

Snacks (133)

Almonds	10
Apricots (IM)	7
Dried beef	7
Butter cookies	10
Candy coated chocolates	10
Candy coated peanuts	17
Candy coated mints	14
Cashews	13
Granola bars	7
Jelly	3
Peaches (IM)	7
Peanut butter	1
Peanuts	13
Soda crackers	14
Drinking water containers	14

Rehydratables (45)

Chicken consomme	7
Chicken rice soup	7
Cream of mushroom soup	7
Turkey tetrazzini	7
Shrimp cocktail	7
Green beans w/mushrooms	4
Italian vegetables	3
Broccoli au gratin	3

Thermostabilized food (24)

Beef steak	7
Frankfurters	4
Turkey and gravy	7
Ham salad spread	2
Tuna salad spread	2
Chicken salad spread	1
Turkey salad spread	1

Fresh food locker

Apples, red 9, green 14	
Bread: whole wheat, 6 loaves	
Carrot sticks, 2	
Celery sticks, 2	
Cheese, 2	
Crackers, 14	
Oranges, 7	
Breakfast rolls, 24	

ACTIVITY 5: ASTRONAUT STUDY - BIOGRAPHICAL REPORT

DAY: Information

LANGUAGE ARTS PROFICIENCY/ INDICATOR: Write biographical sketches.

Read drafts aloud to hear "message."

Proofread/edit for corrections.

MATERIALS: List of astronauts, encyclopedias (sheet attached), computers, word processing program

DIRECTIONS: Students list what information they want to gather about each astronaut.

- place of birth
- education - college
- major
- expertise (etc.)

Use encyclopedia to collect data.

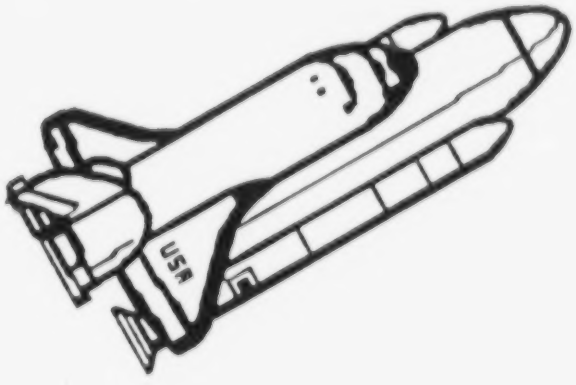
Students give oral reports to group about their astronauts.

Use the word processing program to write the reports.

Share written form with peer for proofreading.

Rewrite in final form.

Teacher makes compilation and gives copy to each student.



Astronauts in Space

Aldrin	Cunningham	Kerwin	Schmitt
Anders	Eisele	Lichlenburg	Schweickart
Armstrong	Engle	Lousman	Scott
Bean	Fullerton	Mattingly	Shaw
Bobko	Gardner	McDuitt	Shepard
Borman	Garriot	Merbold	Slayton
Brand	Gibson	Mitchell	Stafford
Carpenter	Glenn	Musgrave	Swigert
Carr	Gordon	Parker	Thayard
Cernan	Grissom	Peterson	Thornton
Collins	Haise	Pogue	Truly
Conrad	Hauck	Ride	Weitz
Cooper	Hartsfield	Schirra	White
Crippen	Irwin	Schmitt	Worden
			Young

ACTIVITY 6: PROBLEM SOLVING
WHO GOES?

DAY: Information

LANGUAGE ARTS PROFICIENCY/ INDICATOR: Think critically.

Restate ideas from a discussion.

Write persuasive article.

MATERIALS: Activity Sheets (on back of page)

DIRECTIONS: Students work in groups of twos.

Use sheet to decide who they would take.

Each group reports to class.

Reach concensus on a master list.

Student chooses either the most important item or the most important person on the trip to Mars and writes a persuasive paragraph about his or her selection.

Paragraph Design

STATE VIEW

give reasons

RESTATE VIEW

----Example

6. Read to class.

You are commander of the shuttle for the first trip to Mars. The trip will take 10 years travel time. Any time spent on Mars will be in addition to the 10 years. There is room for 11 persons on the ship. You have a long list of astronauts with expertise in a wide range of areas. Which of the following volunteers would you choose and why?

1. clergy
2. teacher
3. doctor
4. dentist
5. beautician
6. computer specialist
7. artist
8. musician
9. lawyer
10. athlete
11. movie star
12. writer-journalist
13. salesperson
14. mayor
15. truck driver
16. mechanic
17. inventor
18. hermit
19. psychologist-counselor
20. scientist
21. anthropologist
22. astronomer
23. comedian
24. chef
25. pregnant woman
26. physicist
27. pharmacist
28. seamstress/tailor
29. chemist
30. designer
31. electrical engineer
32. biologist

ACTIVITY 7: PROBLEM SOLVING
WHAT DO WE TAKE?

DAY: Information

LANGUAGE ARTS PROFICIENCY/ INDICATOR: Think critically.

Restate ideas from a discussion.

MATERIALS:

Study Sheet
chalkboard
Ten small pieces of paper for each student
One envelope for each student

DIRECTIONS:

Put the following list of items on the chalkboard:

apples, water, candy, television, baseball, hair dryer, spacesuit, radio, magazines, first aid kit, oxygen, pillows, blankets, books, cookies, sweater, shoes, knife, milk, shampoo, toothpaste, comic books, soap.

Pass out ten small pieces of paper and an envelope to each student.

Lead a class discussion by saying: "We are going on a trip into space. I have put a list of things on the chalkboard to take on our spaceflight. I want each of you to choose ten of these items to take on your trip into space." Have students write an item on each piece of paper and put it into their "suitcase" (envelope).

Continue with the story..."Here we are on the launching pad. All our friends and our families are here to wish us good luck. As we begin our take-off, we can see everyone waving us good-bye. The Earth behind us seems to be getting further and further into space. It is dark outside the ship, and we can see many stars. Oh, no! A meteor has hit our ship, and we are losing fuel. You will have to get rid of one item in your suitcase to lighten the ship."

Continue with the spaceflight, discovering new galaxies, meeting space people, and experiencing more trouble with the spaceship. Every time trouble is encountered, have students take one more item from their envelopes until only six items remain. Finish the spaceflight by returning home to be greeted with cheers from the entire town.

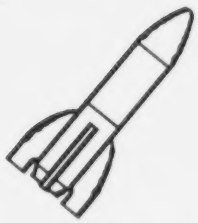
Have students unpack their "suitcase" and share with the class the items that were most important to them.

Continue the class discussion by posing the following questions:

a. You have $1 to spend. You can either buy a milkshake or a book. What do you choose? What do you give up by choosing the milkshake? The book?

b. It is Saturday afternoon and you have just enough time to either visit a friend or see a movie before dinner. What do you give up to go to the movie? To visit a friend? What is the cost involved?

c. It is your birthday and your parents say you can either have a bicycle or spend the day at an amusement park. What decision will you make?



ACTIVITY 8: YOUNG ASTRONAUTS

DAY: Information

SCIENCE PROFICIENCY/ INDICATOR: Use scientific and technological information.

MATERIALS: Young Astronaut Program

DIRECTIONS: Form a Young Astronaut Chapter for your students.

Write to Young Astronaut Council to research what materials, programs, resources, networks, and conferences are available to students and teachers.

Write to: Young Astronaut Program
United States of America
1211 Connecticut Avenue, N.W.
Washington, DC 20036

Construct a space station (use program from Young Astronauts' "Space Station Freedom").

Identify events in the history of rocketry (use program from Young Astronauts "Now we have Lift-Off").

Identify the planets and major constellations (uses Young Astronauts' "Space Watch").

Plan a trip to a Young Astronaut Council Conference.

Recognize the importance and role of the moon in America's past and future space exploration (use Young Astronauts' "One Small Step").

Identify the cooperative efforts on many countries in the exploration of space (see Young Astronauts' "Space around the World").

Use the "Toys that Teach" program from Young Astronauts to teach scientific and mathematical concepts.

ACTIVITY 9: HUMAN REACTION TIME (UPPER ELEMENTARY)

DAY: Information

MATHEMATICS PROFICIENCY/ INDICATOR: Reinforce an understanding of decimals and develop computational proficiency using decimals.

MATERIALS: Meterstick, decimal scale (see side), record sheet

DIRECTIONS:

Duplicate the scale and paste it over a meterstick. The heavy black line should be taped at the bottom, then paste the other strip at the top of the first one. The markings are in 1/100ths of a second.

Divide the class into teams of 2-3 in each group.

Taking turns, have one student rest his/her right or left forearm on table or desk top with hand extended over the edge. Have another team member drop the meterstick so it passes vertically between subject's index finger and thumb, so that he/she may catch it after it starts to fall.

The student should start with thumb and index finger apart the width of the meterstick. This way a standard width is used by all persons.

Start by placing meterstick at zero between the student's thumb and index finger. Release stick and have the student catch it.

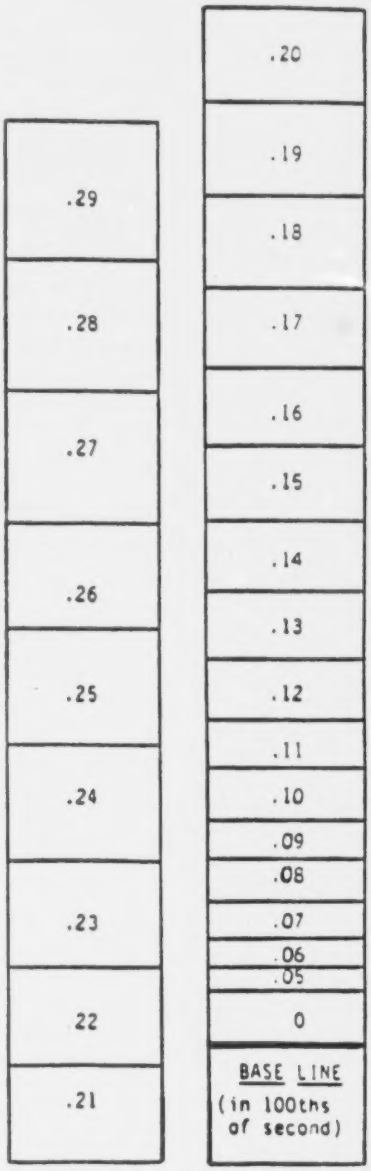
Record the number where student's fingers grasp the stick. Note: If stick is missed the score is 29, not 0.

Have each student perform the test three times and take an average.

Try another way. Tape a student's small cricket clicker to top of the meterstick. Blindfold student and have him/her catch the stick with eyes closed, responding to the "click" of the clicker.

Repeat three times and take an average.

Have students record their averages, both sight and sound. Is there a difference? Does everyone have the same reaction time?



ACTIVITY 10: ASTRONOMICAL INFORMATION

DAY: Information

MATHEMATICS PROFICIENCY/ INDICATOR: Collect, organize, analyze, and interpret data through the use of fundamental analysis procedures and communicate appropriate conclusions.

MATERIALS: Reference and library books on space and space shuttles, computer, data base software.

DIRECTION:

Create a data base to store the information gathered during the research phase.

Research each topic for the following missions:

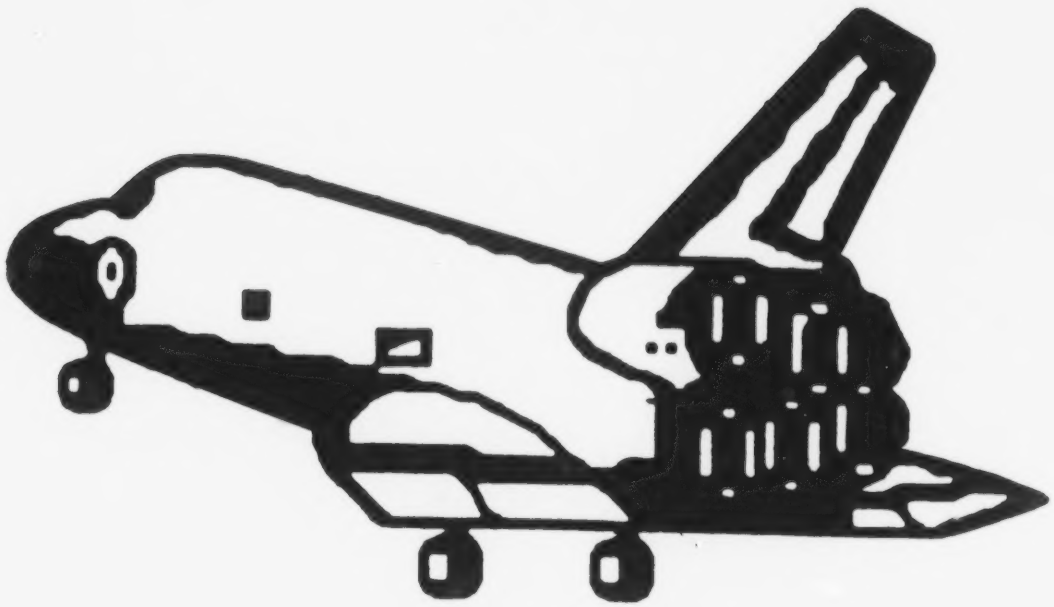
a. Gemini
b. Apollo
c. Skylab
d. Apollo-Soyuz
e. Space Shuttle

Research topics could include:

a. Astronauts on each flight
b. Food items used on the spaceflight
c. Kinds of clothing used on the spaceflight
d. Health patterns of the astronauts on each flight
e. Astronauts blood pressure, pulse, equilibrium--
f. Sleep and exercise patterns of the astronauts
g. Personal statistics of the astronauts: age, height, weight, and education.

RESEARCH

DAY



ACTIVITY 1:	WRITE LETTERS TO NASA
DAY:	Research
LANGUAGE ARTS PROFICIENCY/ INDICATOR:	Write business letters. Share drafts with peers. Use oral language to solve problems.
MATERIALS:	(Attached sheet), paper, pencil, envelope, stamps, computer, word processing program, printer
DIRECTIONS:	Brainstorm questions about space program. Classify the questions that are unanswered into groups pertaining to: Shuttle Space Station Hubble Telescope Extraterrestial Beings Spaceflight (i.e. meteors, planets) Miscellaneous Students select a topic, and write NASA a letter requesting information. Use the word processing program to write the letters. Proofread each others. Final copy - mail.

Task Sheet

The Space Program provides, and will continue to provide, important information to help us manage and preserve our Earth and continue our destiny of understanding our Universe.

Write the National Aeronautics and Space Administration, Washington, DC 20546, for information of interest to you.

ACTIVITY 2: HISTORY OF SPACE EXPLORATION

DAY: Research Day

LANGUAGE ARTS PROFICIENCY/ INDICATOR: Organize material.

Read regularly for extended periods of time.

Interact with a variety of materials.

MATERIALS: Article beginning with "Primitive Belief," shelf papers, butcher paper

DIRECTIONS: Students read article.

Convert information to a time line.

Discuss with class.

Model time line

TIME LINE
SPACE EXPLORATION

4500 B.C.	1500 B.C.	475 B.C.	1473 A.D.	1670 A.D.	1783 A.D.
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
1957 A.D.	1963 A.D.	1969 A.D.	1974 A.D.	1981 A.D.	1984 A.D.
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

PRIMITIVE BELIEFS

Today most informed persons realize that we live on a rotating ball-sized mass called the "Earth" which, in turn, is in orbit around a modest-sized star called our "sun." There have been many different beliefs about our universe. Some said it was flat. Others thought the Earth was the center of the universe and everything rotated around it.

The domain of space above the surface of the Earth has always been a source of wonderment for people. For several tens of thousands of years, the life of primitive people was a struggle to hunt for food and shelter to stay alive and to raise offspring. They must have wondered about the physical hardships imposed by nature--the storms, rain, drought, heat, and cold. The radiations of the sun and the falling of rain made them look to the heavens for explanations of where the mysterious and unexplainable forces of nature originated. To the Egyptians, the Milky Way was the "heavenly Nile."

Important gods lived above in the heavens, and when they died, many people believed they went to a remote "heaven" or after-life beyond the earth. Preoccupation with space is thus as old as history itself. But early people never really understood the regions beyond earth as we do today.

The science of astronomy originated in Babylon and Egypt. With this science, men and women began to understand their universe better. The Babylonian priests acquired a remarkable knowledge about the periods of the sun, moon, and the planets. They developed calendars and sun clocks. It is said the Egyptians recorded sighting the planet Venus 1500 years before the time of Christ.

In Greece, astronomy grew from Pythagoras (475 B.C.), who founded geometry. His followers first suggested the Earth was round or really a sphere.

The great alteration of our concept of the solar system was authored by a brilliant and timid Polish mathematical astronomer, Nicolaus Copernicus (1473-1543). Copernicus believed the Earth orbited around the sun and the sun, rather than the Earth, was truly the center of the solar system.

With the discovery of the telescope of Galileo, people could for the first time get a better look at the heavens. With the telescope, new planets were discovered and the known universe really began to enlarge.

While the telescope enabled people to look at the heavens in greater detail, they also began to dream of traveling to distant places in the universe.

OUR FANTASY OF FLIGHT

One of the earliest artifacts illustrating human flight was a Babylonian seal dating from 3500 B.C. On this seal is pictured the shepherd king, Etena, flying to heaven on the back of an eagle.

In 1500 B.C., a Persian King, Kau Kaus, an astronomer, attempted to fly to heaven by means of fastening eagles to his throne.

Historians tell us also about the classic myth of Icarus and Deoalus. Icarus flew too near the sun. His wax-cemented wings of bird feathers melted, and he crashed to his death.

With the use of Galileo's telescope, with which he detected mountains on the moon, speculations concerning flight to the moon began to appear. The publishing in 1634 of Kepler's "Somnium," four years after his death, was the greatest science fiction classic of space flight in its day.

Francis Godwin's, "Man in the Moon" (1638), dealt with lunar flight using trained wild geese which lived on the moon and migrated to the earth. Twenty-five of them were shackled to a rig so that his hero, Domingo Gonsalez, could be carried along when the geese made their regular migration back to the moon.

Cyrano de Bergerac wrote a novel, "The Voyage to the Moon" (1649), telling of several attempts at lunar flight. Cyrano first tied a string of bottles filled with dew around himself, so when the heat of the sun attracted the dew (evaporation), he would be lifted up to the moon.

The idea of a lighter-than-air ship was proposed by Francesco Lana Terzi in 1670. It was a design which animated thought leading to the invention of the balloon, the first practical means of flight. The first successful balloon flight was a public demonstration on June 5, 1783, by Joseph and Etienne Montgolfier at Annonay, France.

ACTIVITY 3:	MAKE A SPACESHIP
DAY:	Research
MATHEMATICS PROFICIENCY/ INDICATOR:	Develop strategies for solving problems (both routine and nonroutine) through translating relevant verbal and physical data into mathematical language.
MATERIALS:	Set of pattern blocks
DIRECTIONS:	Can you make a spaceship using the pattern blocks?

ACTIVITY 4: EARTH'S ORBIT

DAY: Research

MATHEMATICS PROFICIENCY/ INDICATOR: Develop an understanding of geometric terms and concepts and apply those concepts in problem-solving activities.

MATERIALS: MIRA or other reflective device

DIRECTIONS: Using the MIRA or other reflective device, can you draw an image of the earth's location in its orbit on the following dates?

March 21 June 21 September 21

ACTIVITY 5: LET'S ESTIMATE!!!!

DAY: Research

MATHEMATICS PROFICIENCY/ INDICATOR: Develop estimating skills with whole numbers, fractions, and decimals with application to measurement, geometry, and problem solving.

MATERIALS: Paper and pencil

DIRECTIONS: Estimate the following questions:

1. How many stars are in the universe?

2. How many moons do we know are in our solar system?

3. According to scientists' estimation, how many planets have extraterrestrial life?

Answers:

1.

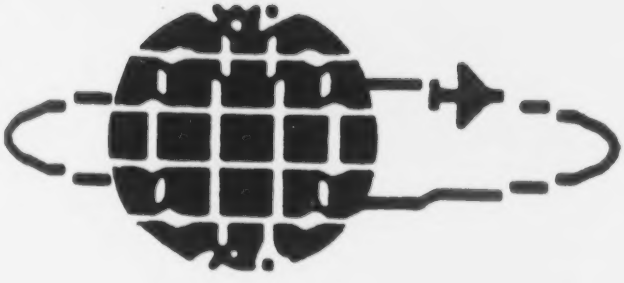
2.

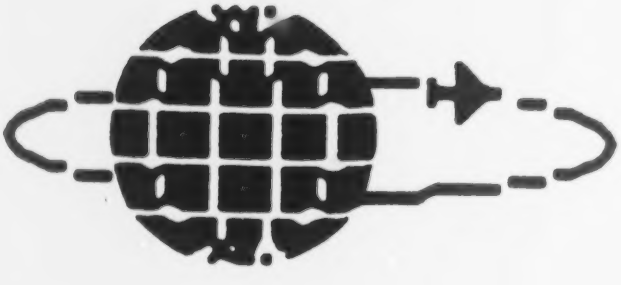
3.

ACTIVITY 6:	LOST IN SPACE
DAY:	Research
MATHEMATICS PROFICIENCY/ INDICATORS:	Develop an understanding of geometric terms and concepts and apply those concepts in problem-solving activities.
MATERIALS:	MIRA or other reflective device
DIRECTIONS:	Send the astronaut to the moon. Show him floating in space.

ACTIVITY

DAY





ACTIVITY 1:	SPACE APPLICATION DAY
DAY:	Activity
LANGUAGE ARTS PROFICIENCY/ INDICATOR:	Write to record important information.
MATERIALS:	Attached form
DIRECTIONS:	On application

****

SPACE

THE NEXT GENERATION

APPLICATION

NASA has asked Congress for funding to design, construct, and launch into orbit by the 1990s a large space structure (space station). Based on your responses on the application you may be selected to serve on one of the NASA decision-making teams and to live in the Sky Lab. Your instructions are listed below.

Name_____ Age_____
School_____ Grade_____
City, State, Zip_____
Male/Female_____

****

I. What job would you like to have in space? List your preferences from 1-5 with 1 as your first choice and 5 as your last choice.

_____Mission Specialist (handle the vehicle's complicated operations)

_____Payload Specialist (record experiment data and perform duties outside of Shuttle)

_____CAPCOM/Spacecraft Communication (non-astronauts, experts on specific experiments)

_____Doctor (focus on the physical well-being of the crew and passengers)

_____Passenger (experience the new frontier as an observer)

****

II. List five personal items that you would take on your space journey to the Sky Lab.

1.

2.

3.

4.

5.

****

III. Check how long you would like to stay in space.

_____ 1-3 years

_____ 4-6 years

_____ 7-9 years

_____ 10 years or more

_____ move to Sky Lab permanently

****

IV. Function and staffing of the station: Your duty is to decide the function and inhabitants of the station. Make a check in front of the statement that represents your opinion.

_____ The Sky Lab should be a military station.

_____ The Sky Lab should be a nonmilitary station.

_____ The Sky Lab should be operated solely by Americans.

_____ The Sky Lab should be operated by an international group of individuals.

****

V. What experiences do you hope to learn from your space travel that you can transmit to the residents of planet EARTH?

****

Signature_____ Date_____

ACTIVITY 2: SPACE CONCENTRATION GAME

DAY: Activity

LANGUAGE ARTS PROFICIENCY/ INDICATOR: This activity is used to make up word games.

MATERIALS: Construction paper, scissors

DIRECTIONS: Copy the two sheets onto construction or other paper and cut them into cards. Mix the cards up and turn them face down. Players take turns turning over two cards, looking for a match. If a player has a match, he gets another turn. Cards can be color coded with a dot on the front to make it a self-checking activity.

ORBITER	WILL BE FIRED AS RETRO-ROCKETS TO SLOW THE ORBITER
SOLID ROCKET BOOSTERS	A SPACE TRUCK
EXTERNAL FUEL TANK	USED TO HELP LAUNCH THE ORBITER INTO SPACE

SPACE SHUTTLE	SITE FOR LAUNCHING THE SHUTTLE INTO EQUATORIAL ORBIT
CARGO BAY	CONTAINS THE FUEL FOR THE ORBITER'S THREE ENGINES
CABIN	SITE FOR LAUNCHING THE SHUTTLE INTO POLAR ORBIT
COMMANDER	SECTION OF THE ORBITER THAT CARRIES THE PAYLOAD
KENNEDY SPACE CENTER	PERSON IN CHARGE OF THE FLIGHT
VANDENBERG AFB	SECTION OF THE ORBITER THAT CARRIES THE CREW

ORBITER MANEUVERING ENGINES	CARRIES THE CREW TO AND FROM ORBIT

ACTIVITY 3: SHUTTLE CIRCUIT BOARD

DAY: Activity

SCIENCE PROFICIENCY/ INDICATOR: Propose generalizations.

MATERIALS: Posterboard, aluminum foil, masking tape, battery, light bulb, and wires.

DIRECTIONS: Trace the shuttle on posterboard. Punch a hole next to each part that you are identifying. Print the names of the parts around the shuttle, with a hole punched by each.

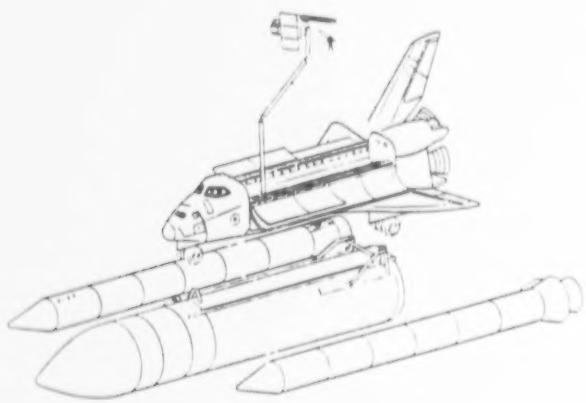
On the back, tape a strip of aluminium foil from each part to its name. Place masking tape between the strips where they overlap to avoid a short circuit.

Cover the back with another piece of poster board. Tape around the edges.

Set up a circuit with a battery, light bulb, and two wires that are long enough to reach all areas of the board.

Touch one wire to a part of the shuttle and the other wire to the name of that part. A correct response will complete the circuit and light the bulb.

ORBITER
ASTRONAUT
SIDE HATCH
CREW CABIN
PAYLOAD BAY
MANIPULATING ARM
STAR TRACKER DOOR
SATELLITE
ELEVONS
SOLID BOOSTER
MAIN LANDING GEAR
NOSE LANDING GEAR
RUDDER/SPEED BRAKE
EXTERNAL FUEL TANK
MAIN PROPULSION ENGINE
FORWARD REACTION CONTROL ENGINE



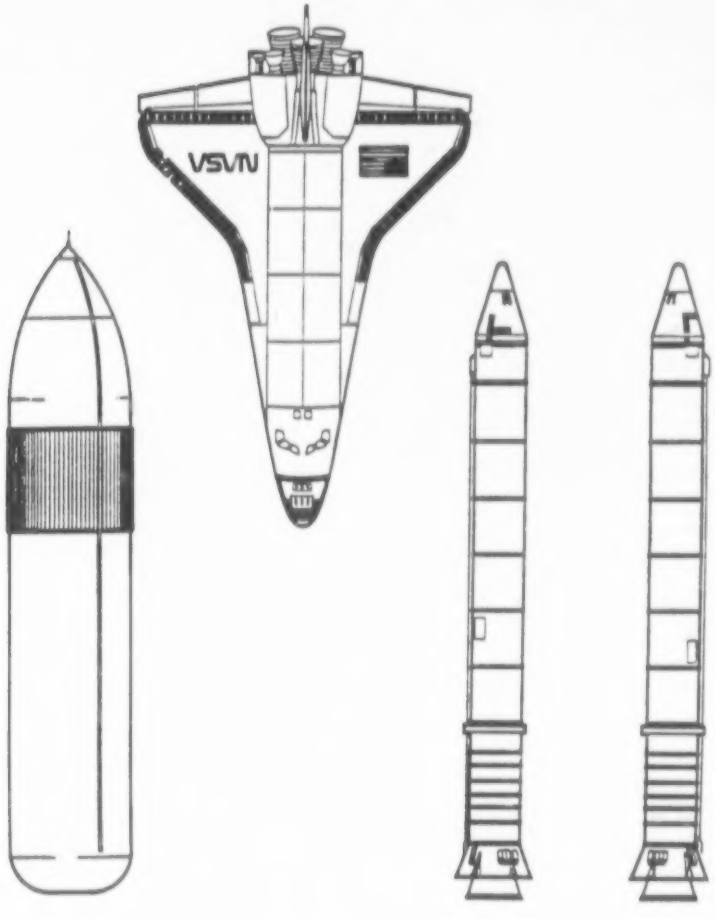
ACTIVITY 4: ASSEMBLE A SPACE SHUTTLE
CUT-AND-PASTE ACTIVITY

DAY: Activity

SCIENCE PROFICIENCY/ INDICATOR:

MATERIALS: Paste, construction paper, and scissors.

DIRECTIONS: Give each student a copy of the shuttle pieces on this page. Have the students cut out the pieces on a sheet of construction paper. Pictures elsewhere in this book can be used as a guide for correct placement.



ACTIVITY 5: THE BALANCED COIN

DAY: Activity

SCIENCE PROFICIENCY/ INDICATOR: Data gathering, examining interactions.

MATERIALS: Coin and paper card.

DIRECTIONS: Cut a 3 x 5 index card in half.

Place a coin in the center of the card on top of your index finger.

When the card and coin are balanced, flick the card off your finger with your right middle finger. Be sure to flick along the horizontal plane of the card.

If done correctly, the coin will stay on your fingertip.

Scientific Principle: This demonstrates Sir Isaac Newton's Theory of Action-Reaction.

ACTIVITY 6: BALLOON-A-TIC

DAY: Activity

SCIENCE PROFICIENCY/ INDICATOR: Propose generalizations that unify a variety of observations.

MATERIALS: One plastic flex straw, one balloon, one six inch string, one pin, and a pencil.

DIRECTIONS: Bend the flex straw forming a right angle.

Measure two inches from the long end of the flex straw and insert the pin.

Tie the mouth of the balloon very tightly to the long end of the flex straw. While holding the point of the pin, spin the straw with your hand to make sure it spins freely.

Insert the tip of the pin from the flex straw into the wood or clay.

Hold the bottom of the straw with your hand and blow thru the free end of the flex straw to inflate the balloon.

Release the flex straw and observe.

The spinning arm of your balloon-a-tic demonstrates Sir Isaac Newton's Theory of Action-Reaction.

ACTIVITY 7: CREATIVE WRITING

DAY: Activity

LANGUAGE ARTS PROFICIENCY/ INDICATOR: Compose original endings to stories.

Write imaginative stories.

MATERIALS: Record or tape of ET or Star Wars sound track, paper, computer, and word processing program.

DIRECTIONS: Lead students in a brainstorming session to elicit vocabulary words to describe Mars. List the words on the board in categories:

Space	Feelings	Mars Surface	Miscellaneous
void	loneliness	rough	alien
immense	fear	smooth	
darkness	isolation	variable	
endless	expectation	hilly-mountainous	
silent	awe	plains	
		terrain	

Play tape while students compose using the word processing program.

Students read orally to class.

Read to students the following story starter:

You are a member of the first flight crew to arrive on Mars. You began your trip in February 1992--it is now February 1997. You are about to step onto the surface of Mars. You and your fellow astronaut step out and ....

ACTIVITY 8:	READ: Space Camp by Joe Claro, Scholastic, Inc., 1986. or The Astronauts by Dinah L. Moche, Random House, 1978.
DAY:	Activity
LANGUAGE ARTS PROFICIENCY/ INDICATOR:	Use speaking to express ideas. Listen for specific information. Share information from reading.
MATERIALS:	Books listed above (one of each)
DIRECTIONS:	Tear book apart by chapters. Assign each student a chapter to read silently. Go around room--each student tells about his chapter. (Read a book in a short period of time.)

* Space Camp - interest level high/readability low-average
* Astronauts - interest level average/readability low

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ACTIVITY 9:	STUDENT IN SPACE
DAY:	Activity
ART AND SCIENCE PROFICIENCY/ INDICATOR:	Researching, applying technology, creative expression

On August 28, 1984, President Ronald Reagan directed NASA to begin a search to choose the first citizen passenger for the space program, "...one of America's finest - a teacher." The next citizen will be a journalist. In the not too distant future, it is possible that a student might be selected to be aboard a Shuttle mission. Perhaps you will be that student. If you were to be selected, these activities could be very helpful in preparing you for the mission.

A. Develop a questionaire to use in selecting a student in space.

B. What type of experiment might the student demonstrate to help classmates better understand a scientific principle.

C. As a class, discuss ways of perparing for your flight.

D. Choose personal items to take on your flight. Primary students could use a backpack as a simulated locker. Intermediate students could use a box the size of a shuttle locker, which is 10- by 14- by 20 inches.

E. Research the present sleeping arrangements. How might you improve on them?

F. List the music you would take along. You are allowed to take two hours of the music of your choice.

G. Have a class or school contest to choose a student astronaut.

H. What part of your experience of traveling in space are you most excited about?

I. How do you feel about future space flights since the Challenger disaster on January 28, 1986?

ACTIVITY 10: SUBJECT AND PREDICATE

DAY: Activity

LANGUAGE ARTS PROFICIENCY/ INDICATOR: Creating sentences, punctuating, and capitalizing

DIRECTIONS: Using the subjects listed below, add a predicate to each one to make a complete sentence. Use punctuation and capital letters correctly.

1. the first moon explorers
2. Russian Yuri Gagarin
3. spacelab
4. Apollo
5. Skylab
6. spacesuit
7. redstone
8. external tank
9. space station
10. lunar rover

ACTIVITY 11: COMPOSITION: WRITING A PARAGRAPH

DAY: Activity

LANGUAGE ARTS PROFICIENCY/ INDICATOR: Comparing sentences and paragraphs

DIRECTIONS: Using one of the topics listed below, write a paragraph. Be sure to follow the guides printed here for you.

HOW TO WRITE A PARAGRAPH

Have your topic clearly in mind.

Indent the first word of the paragraph.

Write a first sentence that will suggest the topic.

Make sure that every sentence keeps to the topic.

Make every sentence develop or tell more about the topic.

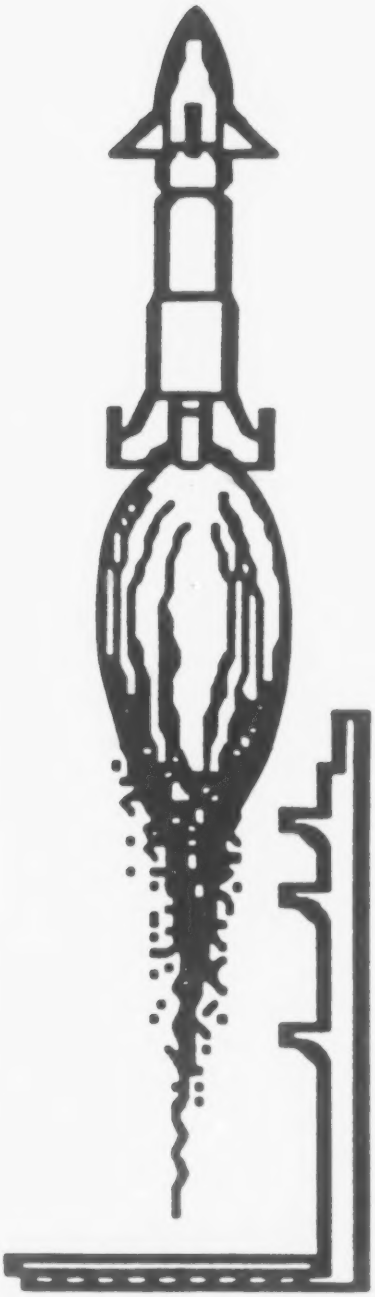
Begin and end each sentence correctly. Include at least four sentences.

SUGGESTED TOPICS:

1. Apollo Mission
2. Space Shuttle
3. Astronauts
4. Living in Space
5. Space Station
6. A space-related topic of your choice

CULMINATION

DAY



ACTIVITY 1: DRAW A LIFE-SIZE ALIEN

DAY: Culmination

LANGUAGE ARTS PROFICIENCY/ INDICATOR: Respond to literature in a variety of ways, e.g., art projects.

Listen for pleasure.

MATERIALS: Butcher paper

DIRECTIONS: Teacher reads orally, The Search - Our Quest for Intelligent Life In Outer Space

Cosmic Quest-students draw life-size alien (Chapter 6).

* Stilley, Frank, The Search - Our Quest For Intelligent Life In Outer Space, G.P. Putnam's Sons, New York, 1977.

* Klein, Michael J. and Poynter, Management, Cosmic Quest, Atheneum, New York, 1984.

ACTIVITY 2: ROCKET PROPULSION

DAY: Culmination

SCIENCE PROFICIENCY/ INDICATOR: Apply verified information, analyze technological systems

MATERIALS: Two 6- or 8-inch balloons; one 3- or 4 ounce paper cup; one plastic straw cut in four equal lengths; 50-60 foot reel of heavy thread or fish line; four pieces of masking tape, 4 inches long.

DIRECTIONS:

Cut the bottom out of the paper cup.

Extend nozzle of balloon B through the now hollow cup and stretching the balloon, inflate it. Hold balloon B between thumb and finger on B side of cup C and pull the nozzle of balloon B against the side of cup C. Refer to illustration.

Insert balloon A into the cup and inflate. Release balloon B. A now holds B in position.

Holding nozzle of A closed, attach the assembly to the four spaced pieces of plastic straw, which should have been placed on the 60-foot string by another group. Refer to illustration.

If a stairway is available, or if you are in a gym, have the Y station higher than the X.

Release Balloon A. What happens? How does the experiment relate to rocket propulsion and staging? What is the value of staging. Discuss such things as the reduction of weight with staging; the construction of smaller parts, rather than large cumbersome ones; the reduction of failure of any one component because of heat or vibration; or the ability to vary thrust.

Discuss the horsepower of rockets. Saturn V has 150 million horsepower. How may average size cars would be required to develop the horsepower of Saturn V?

ACTIVITY 3: PAPER ROCKETS

DAY: Culmination

MATHEMATICS PROFICIENCY/ INDICATOR: Apply verified information, analyze

MATERIALS: Large plastic soda straws (the kind used in fast food restaurants), one per student; sharpened thick pencils (same size as straws), one per student; paper (8 x 10), two sheets per student; cellophane tape, one roll per student; scissors, one per student.

DIRECTIONS:

Cut a strip of paper about 8 inches long and 1 to 2 inches wide.

Roll the paper strip around the pencil and tape. Roll paper strip lengthwise around pencil. Paper should slide easily off the pencil, but not be too loose.

Make several pointed cuts at one end of tube. See Figure A.

Slide the sharpened end of the pencil toward the pointed cuts. Fold the points around the sharpened end of the pencil and tape to form the nose cone. See Figure B.

Cut out two sets of fins. Use the pattern in Figure C. Fold the fins on the dashed lines in the manner shown in Figure C.

Using two pieces of tape, fix the fins to the opposite end of the tube from the nose cone. Insert the pencil for support in taping. See Figure D.

Place the rocket over the soda straw. See Figure E.

Select a firing range to launch the rocket, such as one side of the classroom or a hallway. A high ceiling room, such as an auditorium or gymnasium, is best.

Launch the rocket by blowing sharply on the straw. Be sure to aim rocket in the desired direction.

Measure the distance your rocket traveled. Launch your rocket three times and find the average

Graph the average distance each student's rocket traveled. Generate questions from the graph.

Discussion:

There are many variations in the design of paper rockets. Students should be encouraged to change the shape and size of fins and the length of the tube. Different forms of nose cones should be tried, as well as different placements of the fins on the tube. Large fins can be used to turn the rocket into a glider. See Figure F.

To add extra interest to the activity, competitions can be organized. Try to find out which rocket can go the highest, the farthest, and land in a designated recovery zone, etc.

Fig. A

Fig. B

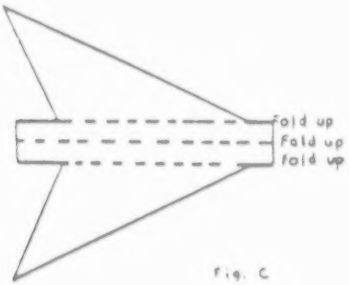


Fig. C

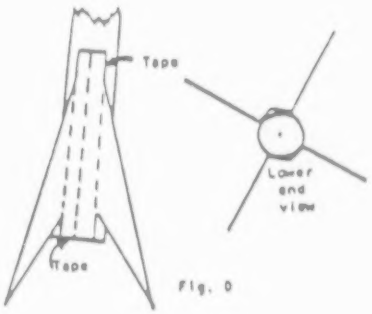


Fig. D

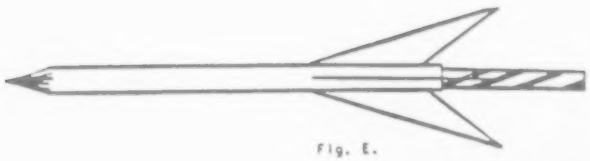


Fig. E.

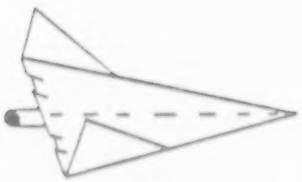


Fig. F.

ACTIVITY 4:	THE MIRA AND THE ASTRONAUTS
DAY:	Culmination
MATHEMATICS PROFICIENCY/ INDICATORS:	Develop an understanding of geometric terms and concepts and apply those concepts in problem-solving activities.
MATERIALS:	MIRA or other reflective device
DIRECTIONS:	Fit the image of one figure exactly onto the other figure. Draw the MIRA-line. Find the corresponding parts of the two figures.

ACTIVITY 5:	WATCH MOVIE
DAY:	Culmination
LANGUAGE ARTS PROFICIENCY/ INDICATOR:	Listen for pleasure
MATERIALS:	See movie list below
DIRECTIONS:	Observe in audience setting.

SPACE MOVIE LIST

ET	Mac and Me
Space Camp	Encounters of the Third Kind
Star Wars	Battle Star Galactica
Star Trek (I-V)	Flash Gordon
Lost in Space	Alien
Alf	Gremlins
My Favorite Martian	War of the Worlds
2001 -- Space Odyssey	Jetson's
Voltron	Empire Strikes Back
Return of the Jedi	Star Trek: The Next Generation

SUPPLEMENTAL

ACTIVITIES

(Addition/subtraction problems with regrouping)

MATH CODE 1

C - 75	O - 66	U - 25	F - 89	I - 83	T - 50
Y - 94	L - 54	A - 98	M - 63	R - 49	W - 35
H - 47	E - 72	S - 19	B - 24	P - 15	N - 91

Put the correct number and letter under each problem to find a space fact.

94 -19	82 -16	36 +18	50 -25	48 +15	60 -36	26 +57	59 +29
___	___	___	___	___	___	___	___
___	___	___	___	___	___	___	___

70 -35	39 +59	50 -31	25 +25	60 -13	34 +38	90 -1	24 +59	70 -21	60 -41	15 +35
___	___	___	___	___	___	___	___	___	___	___
___	___	___	___	___	___	___	___	___	___	___

29 +37	90 -41	73 -49	35 +48	23 +27	91 -19	60 -11	24 +26	92 -26
___	___	___	___	___	___	___	___	___
___	___	___	___	___	___	___	___	___

100 -11	39 +15	27 +67	59 +24	36 +55	30 -11	83 -68	59 +39	90 -15	34 +38
___	___	___	___	___	___	___	___	___	___
___	___	___	___	___	___	___	___	___	___

95

(Addition/subtraction problems without regrouping)

MATH CODE 2

C - 75	O - 66	U - 25	F - 89	I - 83	T - 50
Y - 94	L - 54	A - 98	M - 63	R - 49	W - 35
H - 47	E - 72	S - 19	B - 24	P - 15	N - 91

Put the correct number and letter under each problem to find a space fact.

50 +25	98 -32	40 +14	10 +15	94 -31	69 -45	31 +52	26 +72
___	___	___	___	___	___	___	___
___	___	___	___	___	___	___	___

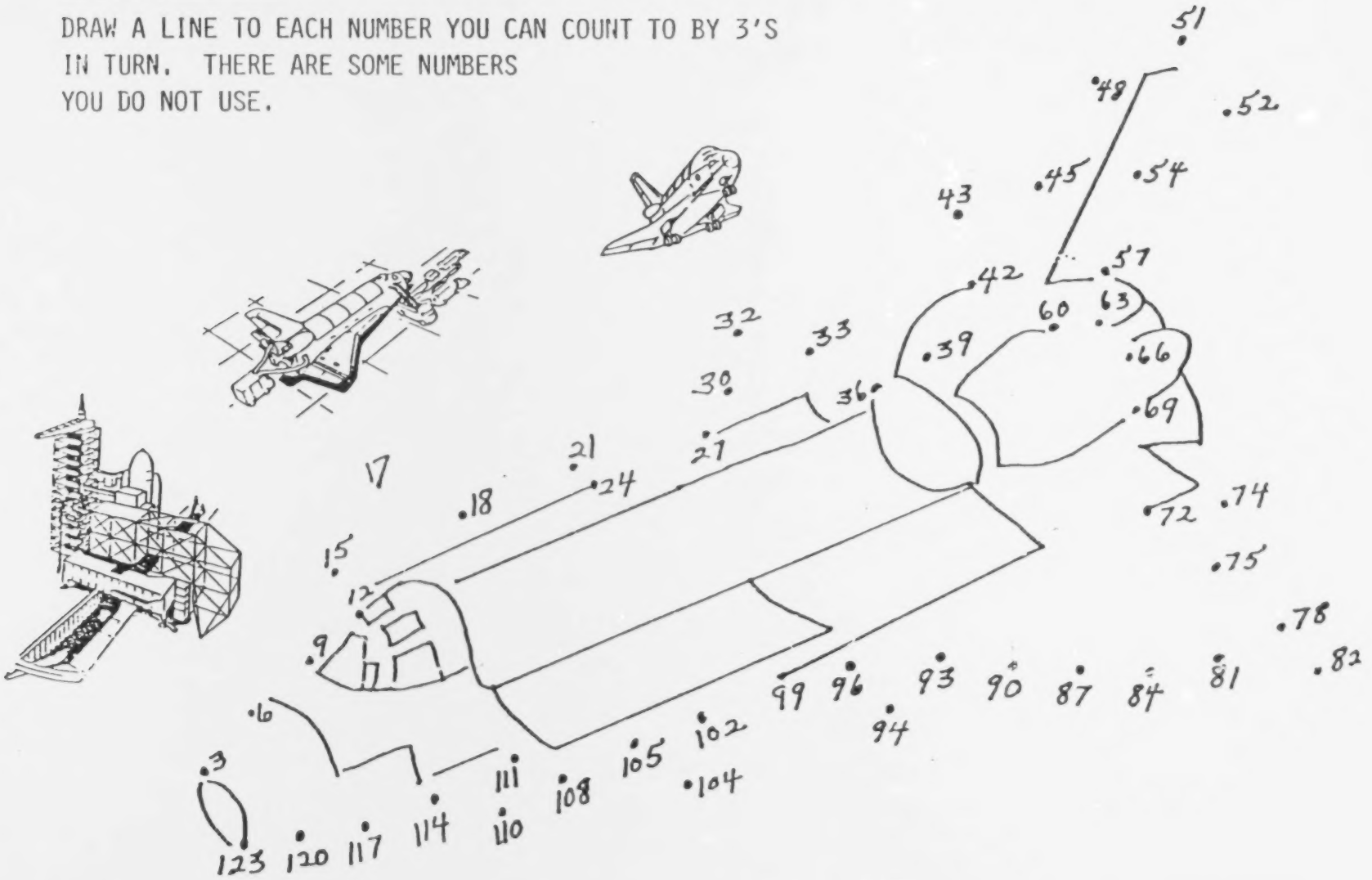
55 -20	14 +84	14 +5	60 -10	89 -42	30 +42	64 +25	22 +61	27 +22	10 +9	70 -20
___	___	___	___	___	___	___	___	___	___	___
___	___	___	___	___	___	___	___	___	___	___

98 -32	19 +30	69 -45	98 -15	60 -10	20 +52	34 +15	80 -30	78 -12
___	___	___	___	___	___	___	___	___
___	___	___	___	___	___	___	___	___

19 +70	76 -22	61 +33	13 +70	50 +41	13 +6	49 -34	26 +72	96 -21	74 -2
___	___	___	___	___	___	___	___	___	___
___	___	___	___	___	___	___	___	___	___

COUNTING BY 3'S

DRAW A LINE TO EACH NUMBER YOU CAN COUNT TO BY 3'S IN TURN. THERE ARE SOME NUMBERS YOU DO NOT USE.



97

NAME _____

98

NAME _____

SECRET MESSAGE #2

CODE:

A	B	C	D	E	F	G	H	I	J	K	L	M
2	4	6	8	10	12	14	16	18	20	22	24	1

N	O	P	Q	R	S	T	U	V	W	X	Y	Z
3	5	7	9	11	13	15	17	19	21	23	25	27

MESSAGE:

9+6 8+8 5+5 7+6 9+7 8+9 7+8 6+9 12+12 5+5

20+1 9+9 20+4 22+2 2+2 6+4 10+7 6+7 7+3 2+6

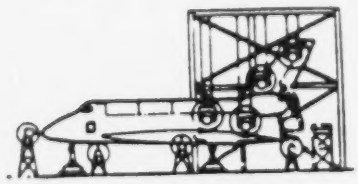
2+0 4+9 1+1 10+5 7+4 9+8 5+1 11+11 8+7 3+2

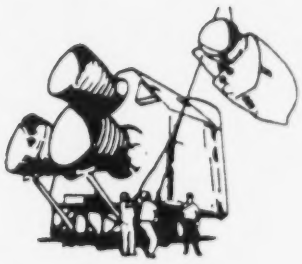
4+2 2+0 2+9 6+5 15+10 10+3 1+6 1+1 5+1 8+2

8+8 0+2 10+1 4+4 11+10 1+1 8+3 3+7

14+1 1+4 0+2 2+1 7+1 8+4 9+2 5+0 1+0

8+5 3+4 0+2 3+3 1+9





Instruction for Reading Activity
Space Exhibit

Introduce Isaac Asimov - Science Fiction Author

Children read story

Discuss - Brainstorm what this Museum will be like in 2157.

List the Exhibits on Display, November 2157

1.

2.

3.

4.

5.

Margie even wrote about it that night in her diary. On the page headed May 17, 2157, she wrote, "Today Tommy found a real book!" It was a very old book. Margie's grandfather once said that when he was a little boy, his grandfather told him that there was a time when all stories were printed on paper. They turned the pages, which were yellow and crinkly; and it was awfully funny to read words that stood still instead of moving the way they were supposed to - on a screen, you know. And then, when they turned back to the page before, it had the same words on it that it had had when they read it the first time. "Gee," said Tommy, "what a waste. When you're through with the book, you just throw it away, I guess. Our television screen must have had a million books on it, and it's good for plenty more. I wouldn't throw it away." "Same with mine," said Margie. She was eleven and hadn't seen as many telebooks as Tommy had. He was thirteen. She said, "Where did you find it?" "In my house." He pointed without looking, because he was busy reading. "In the attic." "What's it about?" "School." Margie was scornful. "School? What's there to write about school? I hate school." Margie always hated school, but now she hated it more than ever. The mechanical teacher had been giving her test after test in geography, and she had been doing worse and worse until her mother had shaken her head sorrowfully and sent for the County Inspector.

He was a round little man with a red face and a whole box of tools with dials and wires. He smiled at Margie and gave her an apple, then took the teacher apart. Margie had hoped he wouldn't know how to put it together again, but he knew how alright; and after an hour or so, there it was again, large and black and ugly, with a big screen on which all the lessons were shown and the questions were asked. That wasn't so bad. The part Margie hated most was the slot where she had to put homework and test papers. She always had to write them out in a punch code they made her learn when she was six years old, and the mechanical teacher calculated the mark in no time. The Inspector had smiled after he was finished and patted Margie's head. He said to her, "It's not the little girl's fault, Mrs. Jones. I think the geography sector was geared a little too quick. Those things happen sometimes. I've slowed it up to an average ten-year level. Actually, the overall pattern of her progress is quite satisfactory." And he patted Margie's head again. Margie was disappointed. She had been hoping they would take the teacher away altogether. They had once taken Tommy's teacher away for nearly a month because the history sector had blanked out completely. So she said to Tommy, "Why would anyone write about school?" Tommy looked at her with very superior eyes. "Because it's not our kind of school, stupid. This is the old kind of school that they had hundreds and hundreds of

years ago." He added loftily, pronouncing the word carefully, "Centuries ago."

Margie was hurt. "Well, I don't know what kind of school they had all that time ago." She read the book over his shoulder for a while, then said, "Anyway, they had a teacher." "Sure they had a teacher, but it wasn't a regular teacher. It was a man." "A man? How could a man be a teacher?" "Well, he just told the boys and girls things and gave them homework and asked them questions." "A man isn't smart enough." "Sure he is. My father knows as much as my teacher." "He can't. A man can't know as much as a teacher." "He knows almost as much, I betcha." Margie wasn't prepared to dispute that. She said, "I wouldn't want a strange man in my house to teach me." Tommy screamed with laughter. "You don't know much, Margie. The teachers didn't live in the house. They had a special building, and all the kids went there." "And all the kids learned the same things?" "Sure, if they were the same age." "But my mother says a teacher has to be adjusted to fit the mind of each boy and girl it teaches and that each kid has to be taught differently." "Just the same, they didn't do it that way then. If you don't like it, you don't have to read the book." "I didn't say I didn't like it," Margie said quickly. She wanted to read about those funny schools.

They weren't even half-finished when Margie's mother called, "Margie! School!" Margie looked up. "Not yet, Mamma." "Now!" said Mrs. Jones. "And it's probably time for Tommy, too." Margie said to Tommy, "Can I read the book some more with you after school?"

"Maybe," he said nonchalantly. He walked away whistling, the dusty old book tucked beneath his arm. Margie went into the schoolroom. It was right next to her bedroom, and the mechanical teacher was on and waiting for her. It was always on the same time every day except Saturday and Sunday, because her mother said little girls learned better if they learned at regular hours. The screen was lit up, and it said, "Today's arithmetic lesson is on the addition of proper fractions. Please insert yesterday's homework in the proper slot." Margie did so with a sigh. She was thinking about the old schools they had when her grandfather's grandfather was a little boy. All the kids from the whole neighborhood came, laughing and shouting in the schoolyard, sitting together in the schoolroom, going home together at the end of the day. They learned the same things, so they could help one another with the homework and talk about it. And the teachers were people.... The mechanical teacher was flashing on the screen, "When we add the fractions 1/2 and 1/4 -----" Margie was thinking about how the kids must have loved it in the old days. She was thinking about the fun they had.

Isaac Asimov (born 1920) came with his family to the United States from Russia at the age of three. As a boy, he loved reading science fiction magazines. This reading stimulated Asimov's interest in science. He studied at Columbia University and then became a professor at Boston University School of Medicine. Asimov has written hundreds of books and articles on scientific and other subjects. He is best known, though, for his science fiction stories.

Space Flight Diploma

Knowledge pertinent to future travel
in our galaxy and those beyond

_____ has successfully
pursued the study of Space Flight.
Having passed this course entitles one to the
rank of "Space Cadet" with all ensuing rights.

_____
Authorizing official

_____
Date

NASA RESOURCES

INTRODUCTION

The primary goal of NASA's Educational Affairs Division is to maintain an adequate pool of scientists, engineers, and other professionals to meet national aerospace needs. Personnel from NASA Headquarters and the nine NASA field centers carry out this national education program covering the spectrum from elementary, middle, and high schools to undergraduate, graduate, and postgraduate levels, and research programs. NASA's educational programs also recognize the importance of upgrading the knowledge, skills, and experience of teachers and university faculty.

NASA offers educators a wide range of educational services, including speakers, publications, audiovisual materials, software, advanced educational technology, curriculum assistance, electronic communcations, in-school satellite programs, student programs, and training opportunities. Information about some of these programs and contact addresses follow.

Elementary and Secondary Programs

For information about the Elementary and Secondary Programs Branch at NASA Headquarters, contact:

Dr. Eddie Anderson, Chief
Elementary and Secondary Programs Branch
Code XEE, NASA Headquarters
Washington, DC 20546
(202) 453-8386

Each NASA field center has a Center Education Programs Officer (CEPO). The CEPOs serve as the primary educational contacts for the elementary and secondary school communities in their geographic areas.

Educational Technology Programs

Spacelink - Spacelink is an information access system that allows individuals to log on and receive news about current NASA programs and activities and other space-related information, including historical and astronaut data, lesson plans and classroom activities, and even entire publications. Although primarily intended as a resource for teachers, anyone with a personal computer and modem can access the network.

Spacelink Direct Dial via Modem: (205) 895-0028
Data word format: 8 data bits, no parity, and 1 stop bit

Spacelink Administrator
Marshall Space Flight Center
Mail Code CA-20
Huntsville, AL 35807
(205) 544-6527

CENTRAL OPERATION OF RESOURCES FOR EDUCATORS (CORE)

CORE is a centralized mail order, audiovisual library for educators; no printed materials are available. Submit a written request on your school letterhead for a catalogue and order forms. Orders are processed for a small fee that includes the cost of the media.

NASA CORE
Lorain County Joint Vocational School
15181 Route 58 South
Oberlin, OH 44074
(216) 774-1051

AEROSPACE EDUCATION SERVICES PROGRAM (AESP)

Aerospace Education Services Program (AESP) specialists conduct workshops for teachers each summer at NASA field centers, elementary and secondary schools, and on college campuses. Workshops cover astronomy, aeronautics, life in space, principles of rocketry, Earth science, and remote sensing. A typical workshop includes how-to and hands-on activities to help teachers incorporate what they learn into classroom activities and programs to supplement existing curricula. Contact the Center Education Programs officer at the NASA field center that serves the school's geographic area, or contact:

Elementary and Secondary Programs Branch
Educational Affairs Division
Code XEE, NASA Headquarters
Washington, DC 20546
(202) 453-8386

COOPERATIVE EDUCATION PROGRAM

A NASA-wide program, the Cooperative Education Program gives high school, college, and graduate students an opportunity to work at a field center while completing their education. Each field center negotiates its own cooperative agreements with schools in its geographic area. Contact the Center Personnel Officer at the NASA field center that serves the school's geographic area, or contact:

Personnel Policy and Work Force Effectiveness Division
Mail Code NPM, NASA Headquarters
Washington, DC 20546
(202) 453-2603

SATELLITE VIDEOCONFERENCES

During the school year, a series of educational programs is delivered by satellite to teachers across the country. The content of each videoconference varies, but all cover aeronautics or space science topics of interest to the educational community. The broadcasts are interactive; a number is flashed across the bottom of the screen, and viewers can call collect to ask questions or take part in a discussion. For further information, contact:

Mr. William D. Nixon
Educational Technology Branch
Educational Affairs Division
Code XE
NASA Headquarters
Washington, DC 20546
(202) 453-8388

Videoconference Coordinator
NASA Aerospace Education Services Program
Oklahoma State University
300 North Cordell
Stillwater, OK 74078
(405) 744-7015

For more information about Elementary and Secondary Programs

If you live in:	Center Education Programs Officer	Teacher Resource Center
Indiana Illinois Michigan Minnesota Ohio Wisconsin	Dr. Lynn Bondurant Chief, Educational Services Office Mail Stop 7-4 NASA Lewis Research Center 2100 Brookpark Road Cleveland, OH 44135 (216) 433-5583	NASA Lewis Research Center Attn: Teacher Resource Center Mail Stop 8-1 Cleveland, OH 44135 (216) 433-2016 or 2017

FILMS

51	Freedom 7
59	Friendship 7
101	The Flight of Faith 7
131A	Living in Space - Part 1
134	The Four Days of Gemini 4
160	Legacy of Gemini
181	The Apollo Mission
187	The Flight of Apollo 7
189	Apollo 9: The Space Duel of Spider and Gumdrop
194	Eagle Has Landed: The Flight of Apollo 11
217	Apollo 15: In the Mountains of the Moon
222	Apollo 16: Nothing So Hidden
227	Apollo 17: On the Shoulders of Giants
256	The Mission of Apollo-Soyuz
318	Space Shuttle: A Remarkable Flying Machine
322	"First Flight Report" (STS Post Flight Press)
	Skylab
	Space in the 70's -- Man in Space -- The Second Decade
	Space Shuttle Press Conference Video Tapes
	Survival in Outer Space

Slides and filmstrips may be ordered from:

Teacher Resource Room (M.S. 8-1)
Visitor Information Center
NASA Lewis Research Center
21000 Brookpark Road
Cleveland, Ohio 44135

Telephone: (216) 267-1187

SPACE CAMP INFORMATION

THE SPACE AND ROCKET CENTER
One Tranquility Base
Huntsville, AL 35807-0680

SPACE CAMP	SPACE ACADEMY I	SPACE ACADEMY II
(Grades 4-7	(Grades 7-9)	(Grades 10-12)

ANSWERS TO FREQUENTLY ASKED QUESTIONS

Who can attend?

Any student from Grade 4 and above who is recommended by a classroom or science teacher.

When should I register?

Early registration is strongly recommended. Sessions are filled on a first-come basis. Easter holidays and summer programs fill quickly.

How can I register?

The quickest way is for your parent/guardian to reserve a session with a credit card. Phone the Reservation Center at 1-800-63/SPACE or (205) 837-3400.

Will I be met at the airport?

A badged team leader will meet your flight at the gate. Transportation to the airport gate for your return flight home is also provided.

Where will I stay? Eat?

Supervised lodging and cafeteria facilities are included in your tuition.

Who are the counselors?

The team leaders are highly motivated and well trained young adults from universities throughout the United States. most have earned, or are seeking, college degrees in engineering, science, or education.

Programs for adult teachers are also provided.

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BOOKS

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Colby, Carroll B., Astronaut in Training, Lippincott, 1975.

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Dwiggins, Don, Eagle Has Landed: The Story of Lunar Exploration, Golden Gate, 1970.

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Ride, Sally, To Space and Back, Lothrop, Lee and Shepard, 1986.

Ronan, Colin A., Deep Space, MacMillan Publishing, 1982.

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Von Braun, Wernher, and Frederick Ordway III, History of Rocketry and Space Travel, Crowell Co., 1975.

Walsh, Jill Patton, The Greenbook, (fiction).

Yenne, Bill, Astronauts: The First Twenty-five Years, Exeter Books, 1986.

Resource Guide of Tests Available for Assessing Reasoning and Higher Thinking Processes

Title: Canadian Cognitive Abilities Tests
Abstract-Reasoning
Nelson-Canada, Ltd.
1120 Birchmount Road
Scarborough, Ontario MIK 5G4

Title: ACER Test of Learning Ability
Aptitude-Tests
Australian Council for Educational Research
P.O. Box 210
Hawthorn, Victoria, Australia 3122

Title: Test of Problem Solving
Cognitive-Tests
LinguiSystems
1630 Fifth Avenue
Moline, IL 61265

Title: Primary Test of Higher Processes of Thinking
Cognitive-Processes
Tests in Microfiche; Test Collection, Educational Testing Service
Princeton, NJ 08541

Title: New Jersey Test of Reasoning Skills, Form A
Abstract-Reasoning
Dr. Matthew Lipman
Institute for the Advancement of Philosophy for Children
Test Division
Montclair State College
Montclair, NJ 07043

Title: Kranz Talent Identification Instrument
Abstract-Reasoning
Bella Kranz
P.O. Box 3555
Jersey City, NJ 07302

Title: Test of Cognitive Skills, Level 1
Academic-Aptitude

Title: Test of Cognitive Skills, Level 2
Academic-Aptitude

Title: Test of Cognitive Skills, Level 3
Academic-Aptitude
CTB/McGraw Hill
Del Monte Research Park
Monterey, CA 93940

Title: Nonverbal Test of Cognitive Skills
Cognitive-Ability
The Psychological Corporation
555 Academic Court
San Antonio, TX 78204-0952

Title: Science Reasoning Level Test
Cross-Cultural-Studies
Logical-Thinking
ERIC Document Reproduction Service
3900 Wheeler Avenue
Alexandria, VA 22304
(ED144988; 28 pages)

Title: Test of Ability to Explain
Logical-Thinking
ERIC Document Reproduction Service
3900 Wheeler Avenue
Alexandria, VA 22304
(EDO40106; 374 pages)

Title: Creative Response Matrices Tests
Cognitive-Processes
Test in Microfiche; Test Collection, Educational Testing Service
Princeton, NJ 08541

Title: Ross Test of Higher Cognitive Processes
Abstract-Reasoning
Academic Therapy Publications
20 Commerical Boulevard
Novato, CA 94947

Title: The Cornell Conditional-Reasoning Test, Form X
Cognitive-Style
Illinois Thinking Project
University of Illinois
1310 South Sixth Street
Champaign, IL 61820

Title: Oregon Academic Ranking Test
Ability-Identification
Western Psychological Services
12031 Wilshire Boulevard
Los Angeles, CA 90025

CREDITS

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1. NASA Lewis Research Center
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2. Michigan Aeronautics Commission
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   Lansing, MI 48906

   a) Come FLY With Me (Grades K-6)
   b) Come FLY With Me (Grades 7-9)

3. Georgia State University
   Aerospace Resource Center
   University Plaza
   Atlanta, GA 30303

   a) Sir Isaac Newton Program